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THE UNITED STATES MID-PACIFIC NAVAL SUPPLY
STATION.

BY

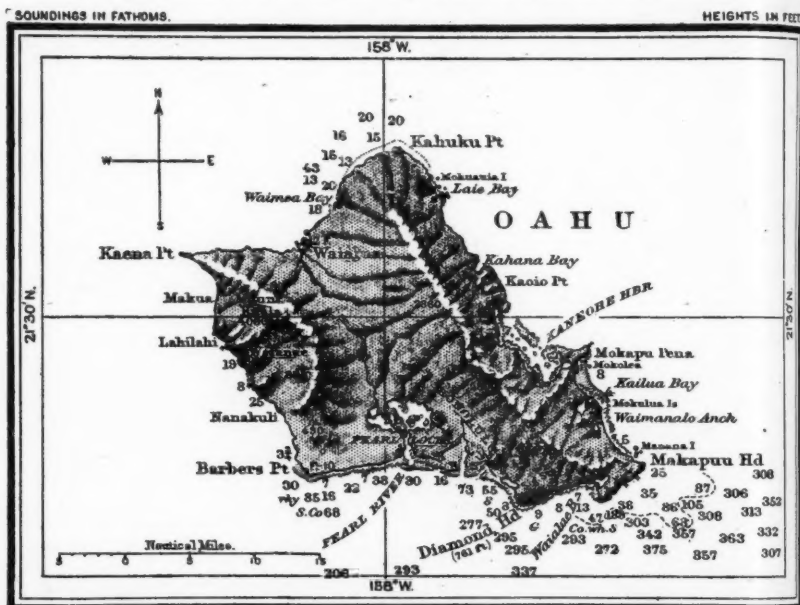
G. W. LITTLEHALES.

There is a valley in Oahu, stretching throughout the island's short length of twenty miles from the ocean on the north coast to the ocean on the south, and bounded on the east and west sides by knife-edged mountain ridges rising to a height of about 3,000 feet. At the northern end of this gorge-like valley, on the ocean edge of the almost level plain into which the ridges of the interior die out in approaching the sea, is Waialua, a port and centre of population of considerable importance in the Hawaiian Islands; at the southern end of the valley, the subsidence of the volcanic mountain, whose top has become the island of Oahu, has brought about the burying of the lower courses of a river, causing the waters of the ocean to flow inward through the river channel and form an irregular expanse of water known as Pearl Lochs. The general depth of the waters of the Lochs is about 50 feet, but the Pearl River, which is the narrow channel leading to the sea, is in general almost twice as deep, except at the seaward entrance, where a bar, running across the channel even with the outer edge of the coral reefs that fringe the coast, rises to within 10 feet of the surface.

This bar was a weighty element of consideration in all the investigations and discussions that took place with reference to the establishment of a United States Naval Supply Station in Pearl Lochs in the decade preceding the ratification, in 1887, of the Convention of 1884 between the United States of America and His Majesty the King of the Hawaiian Islands, in the second Article of which "His Majesty the King of the Hawaiian Islands grants to the Government of the United States the exclusive right to enter the harbor

of Pearl River, in the Island of Oahu, and to establish and maintain there a coaling and repair station for the use of vessels of the United States, and to that end the United States may improve the entrance of said harbor and do all other things needful to the purpose aforesaid."

There had been surveys by the officers of the U. S. S. *Kansas* in 1873, of the U. S. S. *Pensacola* in 1875, of U. S. S. *Vandalia* in 1887, which gave complete information about the physical characteristics of Pearl Lochs, but, as far as they touched upon an examination of



the formation of the bar, they gave rise to the general belief that both at Pearl River Entrance and at Honolulu, which lies five miles to the eastward, the coral reef that skirts the south side of Oahu extended across the entrances to form solid coral bars. Notwithstanding the anticipation of extensive submarine blasting operations to remove the bar, public opinion clung to the Pearl River region on account of its magnificent capabilities for military defence. In 1892 the Hawaiian Government undertook operations for the removal of the bar at Honolulu and, contrary to the prevailing opinion, found that there is a deep channel filled with sand passing

through the fringing reef of the coast and leading into the basin known as Honolulu Harbor.

This discovery immediately gave rise to the supposition that the Pearl River bar is also composed of sand, and that, therefore, the question of opening Pearl Harbor might be disposed of without undertaking formidable and expensive work. The entrance to Honolulu was deepened from 21 to 30 feet. The whole work was performed in a short space of time by a suction-dredge which pumped the sand from the bar and discharged it behind a retaining wall built upon the reef at the edge of the harbor. Rear-Admiral J. G. Walker set the matter at rest in June, 1894, while commander-in-chief of the Pacific Station, by causing a proper examination of the Pearl River bar to be made by an expedition from his flagship, the *Philadelphia*. They made twenty-eight borings on the bar to a depth of 30 feet below the surface of the water and found nothing but coral sand which had been washed in between the entrance-walls formed by the coral-reef. Lieutenant W. M. Wood, one of the most observant and successful of the surveyors that have been engaged upon the Pearl River bar, reports as follows with reference to the manner in which the sea breaks upon the coast at Pearl River: "It appears that the prevailing local swell setting on this bar is caused entirely by the trade-wind and is more or less heavy according to the strength of the trades. It approaches the bar well from the southward, evidently being materially changed in direction as it sweeps around the eastern end of Oahu. Hence on the bar the wind which causes the swell crosses the latter nearly, if not quite, at right angles to the direction of its progress."

This is a most important observation for him to have made, for in it lies the information that is necessary to explain how the Pearl River entrance came to be filled with sand. The waves of this coast do not approach the land with the line of breakers parallel to the beach, but from the southeastward in a direction slanting toward the beach. Breaking on the eastern headland of the entrance to the river they carry the coral-sand, with which they become laden in their shoreward passage, as far as possible toward the west and then, when their force is spent and the sand is deposited, they slip back into the sea under the force of gravity and by the line of shortest descent.

A look at the accompanying chart will show that the most commodious anchorage is that in East Loch, lying north of Ford Island. It is about half a mile wide and a mile long within the eighteen-foot curve. There are other places where a ship can anchor, but a large

ship would have little room to swing. In the reports of twenty years ago upon the suitability of the harbor for naval purposes there was generally to be found a declaration that the place is commodious, but what was regarded as commodious by the commanders of the navy of twenty years ago has come to seem contracted for the manœuvring of the huge ironclads of to-day, and it is doubtful whether the full measure of the expectations of the past can ever be realized in a dockyard on Pearl Lochs.

A final and thorough hydrographic survey of Pearl River and Lochs was made by the officers of the U. S. S. *Bennington* between August and December, 1897, and from the standpoint of the navigator this harbor is probably better known than any other of no greater commercial importance. Since the Hawaiian group has been annexed to the United States public attention has ceased to be centred upon Pearl Lochs, because all the advantages that were sought there are already present in a developed state at Honolulu.

GEOGRAPHIC CONDITIONS THAT MAKE GREAT COMMERCIAL CENTRES.

BY

MAJ. ALFRED F. SEARS, C.E.

The student of American history will be struck with one remarkable, overtowering fact, which is that the men who inaugurated civilization upon this western hemisphere did not attempt to transplant here the old life of Europe, but from the very beginning, whether wittingly or otherwise, made this in truth morally and politically a new world. The result has been that principles, which seemed established for the stability of earth, have presented themselves here as problems to be wrought to a solution with travail and expense of gold.

If the problem about to be discussed ever appeared as such in the Old World, it was settled ages before this continent was known to the civilization of Europe. But the European had never formulated the principles on which he established commercial ports, and if he had, the American would have ignored the equation, declaring that the elements being different on this side the globe, the results must be different. The American, like all youth, would insist on his own experience to discover that there are natural laws of commerce, the same the world over, the only difference being that in a wide, sparsely settled territory, like the United States, the ramifications of trade are more extended and therefore more attenuated.

The business of the world is done at centres of exchange. These centres in our country are the cross-roads grocery and variety store; then the knot of a half-dozen larger establishments, surrounded by a few dwelling houses, a church, a school-house, a post office, and to-day a liquor saloon and railroad station. A large village follows, called perhaps a country town, to which many hamlets are tributary; and the shire town, larger than any yet mentioned and containing all their advantages, with the court-house of the county, possibly a saw-mill and some manufacturing establishments. After that comes the commercial port of the region.

Without reflection, it would seem natural that all the smaller establishments should make towards the coast, and that the commercial port of a region would be the nearest of all to the great highway of nations; that the nearer the ocean a good harbor can

be found, the better the prospect for building the commercial centre of exchange of any region.

On account of the influence of railroads and capital in rooting out old stage stations and building up some prairie towns or manufacturing and suburban villages, it has come to be believed that these agencies are able to control the fortunes of whatever place, and are all that are requisite to bring new cities into being and maintain them in prosperity.

Our Atlantic coast is strewn with ruined hopes in the shape of stillborn cities, having excellent harbors and abundant water front, of which the only *raison d'être* is superior facility of access from the ocean.

There has been abundant honesty of purpose in the design and no excessive credulity in the investment; but there does appear to have been a failure to comprehend and appreciate the laws of trade affecting the project. It becomes, therefore, a proper study to ascertain if capital is justified in assuming to force the solution of so important a problem, and whether there is not involved as superior to capital a natural law, the elucidation of which shall aid in the settlement of these questions.

As the investigation proceeds, the problem undertaken appears so clear and the conclusions so natural and just that one is almost deterred by their simplicity from stating them so formally. But, when we reflect that however clear and natural and just the truth seems to be, many of the wisest men of affairs are constantly failing in this field, we recognize the necessity for such a statement as shall make it not only positive, but tangible, and remove, so far as we are able, a certain class of speculation from the region of chimera to a field of certainty.

More than a half-century ago, when the pioneer steamer of the Cunard line entered Boston harbor, the merchants of that enterprising town felt assured of commercial triumph in the race with New York, because they were twenty-four hours nearer Liverpool than their sister. Some not too "wise men of Gotham" were alarmed, and wondered if they had not committed an error when they settled in the Dutch metropolis, although the population of New York was 300,000 and Boston contained less than a third of that number. To-day New York is the centre of a population of 5,000,000 and Boston of somewhat less than a million. A steamer leaves New York daily for Europe, and another sails once a week from Boston. To the wonderment of the Boston merchants, New York and not Boston has become the commercial metropolis

of the country. In those days, Boston boasted the two or three wealthy men of America. A Boston bank note was as current all over the country a half-century ago as a national bank bill of the present day. This could never be said of the banks of New York, nor of any other city in the United States. The Boston business man figured up the situation logically, as it appeared on the surface of things, quite in his favor. He said: We have the American port nearest Europe by twenty-four hours; an excellent harbor covering one hundred square miles; we have enormous capital and can offer trade every facility it demands; we have the most intelligent population, the purest municipal government in the world; the highest reputation for commercial probity and honor; all this with business liberality and enterprise. "The Solid Men of Boston" stood for a commercial proverb. Nevertheless, New York has pushed ahead, and no amount of money expended to tap by a short route the western country north of New York, or to draw traffic directly from New York by shorter railroad lines, has yet effected the object of the projectors or is likely to effect it.

On investigation, this result appears in harmony with a natural order, independent of the enterprise, wealth and character of merchants. New York is more than 200 miles nearer the heart of the country than Boston. This it was made her advantage. The moving mass that seeks transportation reckons that distance to be as nothing on the ocean compared with the cost of movement on land or river. The cargo of a great steamer transported between New York and Boston fifty years ago, would have demanded the service of ten locomotives and four hundred cars, with all the cost of transshipment. On board the ocean steamer it represents only the comparatively inexpensive continuance of her voyage for another half day.

New York and Boston are not unique examples of such a relation of things. Going south we find that every commercial port of the country has been made the mark of an ambitious rival, under the mistaken apprehension that an error was committed in the original location.

Thus, Philadelphia, on the Delaware, 120 miles from the ocean, has grown into grand proportions, and continues to grow, in spite of the desperate exertions of the two or three ports greatly nearer the highway of nations. Commerce refuses to be persuaded to avoid a tedious navigation against the chances of head winds in a narrow roadway, and avail itself of a port easy of access in the lower bay.

Another instance of the perversity of commerce in passing by great advantages to get up stream is witnessed in the position of Baltimore, 108 miles from Hampton Roads.

Continuing along our southern coast, circumstances of the Civil War led to the development by northern capital of one of those enterprises on that coast, that was to revolutionize the commerce of the region and destroy the two old cities of Savannah and Charleston. A harbor nearer the sea and accessible to vastly greater ships than can enter Charleston was found at Port Royal, of which, the Encyclopedia says, "its harbor is one of the finest in the world," and this, it was believed, would drain both those towns of their wealth and population. Capital seized the point and tapped the neighboring country with its railroad. Streets, wharves, warehouses, corner lots and advertisements flourished for a time. New York was to be supplanted by a great seaport, towards which all the trade of the South, with its immense treasure of cotton, was to rush for direct shipment to Europe, without the intervention of fearful Wall Street and a cotton exchange on a strange soil. Port Royal was to be like the focal centre of a folding fan, towards which all the ribs pointed from the plantations of the entire grand Southern territory. But, after thirty years of struggle, Port Royal is a dull shipping point, with a negro population of about 1,000, a sort of back door to the cities it was designed to obliterate; and Savannah and Charleston remain live cities.

For twenty-five years capital struggled to build a commercial city at Brunswick, Ga., in rivalry to Savannah. The capital, the superior facilities and the twenty-two feet of water on the bar, all still exist there, but as yet no important port has arisen from their ingenious combination. To-day it is a town of palaces occupied by negro laborers.

And all this, notwithstanding the fact that both cities—Savannah and Charleston—must be reached from the ocean, by crossing bars that give inferior facilities, both as to safety and depth of water, to those offered by the new enterprises.

It will presently appear that in these as in all other cases the effort of commerce is to reach the producer; to get as close to him as possible to sell the supplies the wealth of his production will permit him to buy; and to seize his produce for the profit of its marketing.

And still, continuing along the southern coast, we come to another similar project for building up a commercial city at Fernandina, Florida. In its ambitious progress towards this great

future it would destroy the value of Jacksonville, then occupying the envied relation to an extensive territory, believed to be entering a promising era. The only apparent argument against such a result lay in the fact that Jacksonville had the start, by several years, and a population of 2,500 souls, among whom were counted the leading men of the State in wealth and character. But the harbor of Fernandina seemed to possess every commercial combination for the success of the scheme. It was on the inside of Amelia Island, only six miles from the bar over which vessels drawing twenty feet could pass in ordinary high tides, while Jacksonville was twenty-five miles from the ocean, and must be reached by crossing a dangerous bar on which the water was at best but twelve feet deep and often unfit for passage, by reason of the heavy rollers that broke over it whenever the wind was east of the meridian. Fernandina is the healthier of the two sites; yellow fever dies out, when brought to Amelia Island, whereas it has twice decimated Jacksonville. A railroad from Fernandina to the Gulf of Mexico was in course of construction, and would put all the Gulf ports in close connection with a first-rate harbor on the Atlantic.

Fernandina was, moreover, a pet of the national Government. United States officers had been employed in its railroad construction and in buoying its harbor as in pushing forward the coast surveys, which should make the superior value of the port known to the world of commerce. Distinguished politicians of the dominant party controlled the enterprise; a United States Senator was its president and the Governor of the State of Florida was its home guardian. The town site and the Florida Railroad were bought by a distinguished New York capitalist; and another northerner has spent millions in railroad and canal lines in Florida, in palatial hotels and the development of winter resorts; four steamship lines run to Fernandina. One would suppose that such remarkable prosperity would have been the prosperity of the only good harbor on its coast, and that Fernandina would to-day be an important commercial city. The actual fact is that Fernandina, with its excellent harbor and magnificent intentions, contains a population of 1,800, mostly negroes, while Jacksonville, twenty-five miles up a river, and reached only by crossing the worst bar on the coast, except perhaps at Charleston, has already a population of 36,000, and is become the commercial port of the region, compelling from the national government the attention demanded for the improvement of the St. John's River bar.

Observe now that Jacksonville is in closer connection with the

centre of production than Fernandina. While this town is but six miles from the ocean, Jacksonville, on a river that extends straight in towards the interior—on a line normal to the coast—is, by the difference in distance from the sea, just so much nearer the heart of the country. A railroad from Jacksonville and one from Fernandina cross each other twenty miles from Jacksonville and fifty from Fernandina, the common point reached from the producing centre being thus thirty miles nearer Jacksonville than its rival aspirant, which being on an island is inaccessible to the wagons of the farmers, the absorbing idea of the speculating projectors being, that nearness to the ocean, good harbor facilities alone, would force the country to come to them. Jacksonville is not only nearer the same centre of production that stimulated the greed of Fernandina, it is on a river that stretches away to the south, through more than a hundred miles of fertile territory, thus bringing another producing region into facile connection with the town.

If we go around to the Gulf coast we find New Orleans one hundred miles up the Mississippi River at the head of ship navigation. This great port has crowded as close to the interior of the country as possible, when it might have been established nearer the Gulf and thus escaped the troublesome river navigation. Some years ago a railroad was built through to the coast, passing west of New Orleans, and a line of steamers established to run to the ports of the South. Morgan City still exists, with about 2,000 inhabitants, and does a sort of alley-door business for the great Southern metropolis. Mobile has a population of less than 32,000, although it is nearer the ocean, from which it is more accessible, and has excellent railroad connections. But even Mobile (as well as Morgan City) has been put at the head of the bay on which it is located, thirty miles from the Gulf, so as to get as near the producing centre as possible, \$1,000,000 having been expended on the channel of Mobile Bay by the United States Government to this end. And Mobile is now, as to its accessibility from the ocean, in a better position than New Orleans, while in geographical miles it is nearer the producing centre of which New Orleans has always been and remains the commercial metropolis. Mobile has held this apparent advantage since 1875, and yet its growth in population has remained stagnant or worse, for in 1870 it contained 32,000 souls, while in 1890 there were 200 less.

It is an interesting fact and quite in the line of our argument, that Mobile has taken the trade in tropical fruit away from New Orleans. Mobile is enough nearer the fruit-producing region, and

has facilities for handling the article rapidly not to be had at New Orleans, and every hour in dealing with the perishable stuff is of value.

Ten years ago, when I first presented this subject to the attention of my profession, the relation of Galveston and Houston in Texas was pointed to as an exception to my conclusion. It was said "Galveston has grown up as the commercial port of Texas; it is the only Texan port having a tolerably good harbor, but ocean-going vessels can be taken on the Buffalo Bayou nearly up to Houston, and with small expenditure of money a port could have been built up at some interior point on Galveston Bay. Galveston is built on a sand bar, practically 50 miles from any agricultural country, directly on the Gulf, and while the wharves on the inside are in a well-protected harbor, the island on which it is built is exposed to the violent action of the Gulf waves. The City of Houston at the head of Buffalo Bayou is fifty miles nearer the agricultural portions of the State; the railroads centre at Houston, and a single line connects Houston with Galveston; still Galveston is the commercial metropolis of Texas; it has become so because its wharves could be reached with less difficulty than those of Houston or even of Harrisburg, at the mouth of Buffalo Bayou." This was the argument adverse to my position. The answer I made at the time was, that "what can be done by a small outlay of money cannot as yet be fairly considered, for Texas is still a new country and must accommodate itself for the present with the existing facilities for its very limited amount of shipping. Glasgow is an example of what an outlay of money in the way of improving a channel will accomplish, and perhaps Houston may one day be another; but as yet no money has been expended."

Now, if I could have looked forward ten years, or if I had made a careful study of all the facts at the time, I should have seen that this very case illustrates the tendency of commerce to get as close to the producer as possible for its port. Houston has become, like Glasgow, an example of what an outlay of money in the way of improving a channel will accomplish. \$193,000 have been so expended by the United States Government in deepening the channel of the Buffalo Bayou, so that if 13 feet can be taken in over the bar to Galveston the same depth may now be carried on up to Houston; and now Galveston, while a commercial port, has taken a secondary position in the commerce of Texas, and is not the port of that region to which Houston is related.

Galveston has commercial importance, but its growth is com-

mensurate with the growth of the coast districts, which has not been comparable to the growth of the interior. Houston, on the contrary, has grown with the development of the interior of the whole State of Texas, the great producing region. It happens, therefore, that Galveston is moving up to Houston, as shown by the statistics of population. Galveston has been a well frequented harbor ever since 1818, when it was the prey of the buccaneers; and the Pirate Lafitte found there a convenient harbor of refuge. After the Civil War, Texas received an important impulse in settlement, and in 1870 Galveston contained a population of 14,000, while that of Houston was but 9,000. But the State grew and the Houston man was closer to the interior than the man at Galveston, though it cost him a good deal to receive his goods. Hence in 1880, its population was 19,000 against 22,000 in Galveston. In 1890, improvements had progressed on the river so as to assure improvement for Houston trade, and its population had reached 28,000 against 29,000 in Galveston, and to-day Houston has a larger population than its rival, if it may properly be so styled, by 5,000. It may be claimed that this result is due to the railroads, which have made Houston a great centre, which is undoubtedly true, but would have had no existence in fact if the natural position of the town had not marked it to capital as the proper commercial centre of exchange instead of Galveston. The railroads would have gone to Galveston, but they have instinctive recognition that Houston and not Galveston is the distributing point for the merchant from the outside, who wishes to secure the trade of the interior of Texas. The natural result is that the wholesale trade of Galveston is moving thence to Houston, which, now greater in population and with greater movement in money, as exhibited in its bank clearances, will show in the next census that it has outstripped the old town in those features of wealth and prosperity that make a commercial centre.

But now another reflection arises touching the future of Galveston, of which the decadence may yet be arrested. The United States Government is spending \$6,000,000 in the construction of jetties at the mouth of Galveston Bay for the purpose of admitting our largest warships to a harbor on that part of the Gulf coast. That port will then be accessible to vessels drawing 30 feet of water. This depth will admit the largest steamships that float, while as yet only 13 feet can be taken up to Houston.

If, then, an extensive coast system arises to support the trade of Galveston, the town will become something more than a mere port or commercial centre for the planters of the interior. It will

be a market, in the category of New York and San Francisco and Liverpool; not certainly in degree, but simply in nature. In that event it will become the point of attraction for Mexican trade and shipments in addition to those of its own limited coast. But Galveston must be *built* to such position by becoming the market of an important coast system which does not yet exist, for the Texas coast is still an unimportant producing territory. Otherwise, it will become and remain only a convenient shipping point, without commercial importance.

But the future of Galveston is an exceedingly nice problem, requiring patient analysis of the data, which cannot be given in the time at our present disposal.

Leaving the Atlantic Coast, we find a rich field of investigation in the far Northwest. The relation to the commercial world of Astoria, on the Columbia River, is an interesting instance of the conflict of capital with law in the attempt to regulate commerce.

Founded by one of the wealthiest, shrewdest, most enterprising and far-seeing citizens of this country, it became as it was intended by him to become, the *dépot* of the fur trade of the Northwest. When the fur trade failed and simply a home market existed for the salmon of the Columbia River, the men who had staked their fortunes or their hopes on that important point beheld with new satisfaction the settlement of great Willamette Valley above them. It was a natural expectation, that Astoria should become the commercial port of all that region. It was an established town; it possessed a harbor six miles wide, safely protected from the ocean, which was close at hand. It has grown continuously and is still growing; but this town, so convenient of access from the ocean, has seen the port of Portland come into being a hundred miles farther up the river and grow to a city of 80,000, while Astoria has never yet sheltered 8,000 souls.

The Northwest has been a prolific field for the exhibition of the speculative spirit of the men who have received vast areas of public lands from the national treasure and, backed by the national credit, have built the great trans-continental railroad systems. The Northern Pacific Railroad Company has been especially ambitious to own the earth and all its outlets. Twenty-five years ago, capitalists interested in developing the promising points along the route of the thoroughfare, determined that the Columbia River terminus of the line must be the commercial metropolis of the Northwest, the port of that great river system. So they located a town at a point sixty miles above Astoria and forty miles below Portland.

Such a magnificent location was to wipe out both former pretensions, and the town of Kalama was born, where railroad and stream and speculators had their union.

Maps were prepared, hotels and churches erected, elevators, warehouses and great docks projected; and the line of the Northern Pacific Railroad was built thence to Puget Sound.

By virtue of its future outlook, Kalama became a county seat. Corner lots in the heart of that famous townplat sold for \$3,000 each; water lots were laid out along the river bank and sold for the sum of \$3,000 per 100 feet of frontage.

Kalama still exists, but only in name; and the investors in its prospects have added the suffix "ty." The Columbia River still flows by its site as broad and deep as when Jay Cooke made note of its promise; but the once well-filled churches are abandoned for want of congregations; a corner of the grand hotel serves the purpose of court-house and jail; the splendid water lots still remain under the shadow of primeval trees, the only improvement they have experienced being in a reduction of annual tax from \$28 to 15c. And yet this bubble was the scheme of men eminent for wisdom. It was inspired by reputable engineers and accepted by intelligent capitalists. Nor can there be any doubt of the uprightness of intention when we consider the high character of the men who gave the project their approval and practical endorsement.

Kalama is but one of several similar experiments that have sprung from the fruitful womb of Northwestern enterprise. When the Oregonian Railway and Navigation Company became the great power of the Columbia River Valley, it attempted a similar scheme; one in which many railroad companies have embarked and failed. Selecting St. Helens, a good place for a harbor and apparently for a town, when it was considered that all the transportation of the great river was in the hands of the monopoly, and several miles nearer the ocean than Portland, it built docks and warehouses and waited for the rush of capital from Portland to its sheltering arms. But the man who had goods to sell was too wise to leave his customers simply to get nearer the ship that brought his goods; and he said to the company if you can't come to Portland some other ship will; the result was the ship had to go to Portland, and St. Helens was abandoned.

The Northern Pacific Railroad Company has made another attempt to build up a commercial metropolis of the Northwest at Tacoma on Puget Sound. The position is well selected for doing the business of a limited district. It can never become a town of

commercial importance. It is at the head of the Sound and thus would seem to be near the heart of the producing region. It happens, however, that the "producing region" does not lie in that direction. There is a limited area of good country that comes naturally down the Puyallup Valley and Tacoma is at the mouth of that valley. We may understand how trifling is the area of production when we know that the Puyallup drainage passes off in a stream navigable only for canoes; that all the trade of Tacoma must come down the line of a single railroad. It was intended to be the terminus of the Northern Pacific Railroad, of which it has been the constant pet. Fine hotels, street railroads and all the modern conveniences of a great capital exist except the business, which is largely in real estate and gives a stock-exchange character to the town.

Some years ago there were ten banks in Tacoma, which sounds large; but their aggregate capital was a trifle more than a million and a half; since recent failures there are but two banks left. Steamships sail from the railroad wharves of Tacoma to China and Japan, just as four steamship lines sail from the wharves of Fernandina and with as little advantage to the port as a commercial centre. The booming advertisements of Tacoma claim annual foreign imports to the amount of \$10,000,000; "mostly," say their authorities, "from China and Japan." That 36,000 people drink \$10,000,000 worth of tea per year seems extraordinary even for Tacoma. The truth is that Tacoma has no particle of interest in those cargoes. They are shipped across the continent to Chicago and New York as rapidly as they can be loaded and got away. The same advertisements tell us of manufactures to the annual amount of \$9,000,000. This is a better claim, but does not justify the great expectations of phenomenal prosperity, it being part of a system by which a land company is to work off its investment.

The Northern Pacific Railroad Company has built car shops in Tacoma that cost \$1,500,000 and the results are given out as the manufactures of Tacoma. There are some saw-mills on the lower edge of the town. They were there years ago, before any railroad was thought of in that region and from six to ten large vessels are always at their wharves loading lumber. These mills and this lumber are owned in San Francisco; not even a pound of sugar or coffee or a loaf of bread is bought for these works in Tacoma. The workmen board in the company's houses, eat the company's food and drink the company's grog. The annual results of the mills are credited to the "City of Destiny" as 130,000,000

shingles and 17,000,000 feet of lumber, with which Tacoma has as little to do as with the creation of the world, save that some use is made of the banks for convenience in paying off men.

No important wholesale trade belongs to Tacoma. There is not in all the town a wholesale drygoods or grocery store. Much of the land once laid out in city lots has reverted to acre property. The street railroad and electric-light business are in the hands of receivers. Its present condition illustrates the impotency of capital's brute force when exerted against the natural laws of commerce. So far, Tacoma has failed to attain a position as the port of the little Puyallup Valley and the limited territory west of the Cascade Range. It has become a simple way station on an important railroad line, since the Northern Pacific Railroad Company has been forced by the demands of business to extend that line to Portland and Seattle. But by the nursing of the railroad company, Tacoma has succeeded in attaining position as a manufacturing town of subordinate importance, which is the legitimate province of capital.

Seattle, on the Sound at the mouth of an extensive river system, the centre of traffic in those valleys, that loads and discharges forty steamers a day, was left aside by the Northern Pacific Railroad Company. It was not the right field for a grand land speculation, being already an established town. It was going to be an easy matter for a powerful railroad company to force the traffic of those valleys, that came to Seattle to buy supplies, from their old channel into the promising property of Tacoma. The merchants of Seattle knew better. They failed to take alarm and held their ground to the surprise and consternation of the speculators. It is easier for one trader to take his goods to a community of a thousand customers than it is for a thousand customers to go a long way from home to buy goods. And so, in spite of the existence of a railroad and all its power, the Seattle man was close to the producer and he saw that his customers had their goods at as cheap a rate as anybody in Tacoma, for he had the Sound and steamers to many points on the coast. Without a railroad Seattle prospered and without booming. It forced the construction of proper Eastern connections and has become indeed a great railroad centre, being the terminus of four transcontinental lines. Seattle is an interesting instance of New England shrewdness.

It will be interesting, now, to look along the northern border of our country and observe the growth of towns on the St. Lawrence River and the Great Lakes.

There was a time when Quebec, the capital of Lower Canada,

was the commercial metropolis of those provinces, but Montreal, 220 miles farther up stream, took its place; and from 1850, when their population was about equal, Quebec has grown from 40,000 to 70,000, while Montreal in the same time has acquired a population of 220,000. It is nearer the centre of production, closer to the heart of the country. Following the same line of experience, Toronto, 333 miles farther inland than Montreal, had in 1871 a population of 56,000 and to-day has nearly 200,000, having somewhat more than tripled, while Montreal has rather more than doubled.

The opening of the Erie Canal in 1825 had a wonderful influence on the growth and future power of two towns. Up to that date, New York had been second to Philadelphia in commercial importance and population; but once the construction of the canal became an assured fact, New York, being brought into closer relation to the producing regions of the country, and cheap communication being established, the great West, as we then knew it, lay at her feet. But also, the little village of Buffalo became an outside ward of the City of New York. Up to 1825, its population had not reached 3,000 and in 1830 it had tripled; and to-day it amounts to 300,000.

Cleveland, farther up the lake, is growing even faster than Buffalo. You would suppose that produce making for the coast would rather go to Buffalo as being nearer the sea and in closer connection with the metropolis of the coast. Now Cleveland had in 1860 about the same population that Buffalo had in '50, but in 1890 Cleveland had a population of 262,000 as against the 254,000 of Buffalo.

A lesson is taught in this connection by the rapid growth of Detroit, 18 miles from Lake Erie, up the Detroit River, and 7 miles from Lake St. Clair, with a population of 250,000; not a harbor on the lake, but crowded into that narrow strait, that the importer may get as close as possible to the promising Michigan peninsula.

Thus, while Detroit supplies Michigan, and Cleveland grasps the wealth of northern Ohio, Toledo has seen the opportunity presented by the limited region lying between them and establishing itself eight miles from the lake, up the Maumee River, is already a great city and doing a service to commerce, the opportunity for which it has snatched from Detroit and Cleveland, because nearer than they to the producing territory.

We approach now the wonder of the century. Chicago is in-

creasing in population at a rate nearly double that of the combined cities of New York and Brooklyn. In three great products, grain, lumber and live stock, it leads the world. Lying at the foot of Lake Michigan, it appears in a *cul-de-sac*. How does it come that a great centre of exchange has grown up at Chicago? It seems more rational for it to have come to Detroit or Toledo, 140 or 160 miles farther east. It is 800 miles from the ocean across country and 2,000 miles away by the only water route open to it. Is it great by having been made the focus of so many railroad lines? On the contrary, it is the centre of so many railroads because its position marked it for greatness. It is a great railroad centre because it lies so close to the heart of an exceedingly productive country. Chicago does not exist by reason of the railroads, but the railroads do exist because of Chicago.

Proceeding still westward, we find Duluth-Superior at the upper end of Lake Superior. We see at once it occupies a promising position, not because it has been made the terminus of railroad lines, but because it is favorably situated geographically, to be the *entre-pôt* of an important producing section. Observing, however, that Duluth has a fine future only on the west and south, and that for a very limited distance, we discover at once that it is not to become another Chicago, nor even the peer of Detroit or Cleveland. The idea has been indulged that Duluth with its 30,000 souls may absorb St. Paul and Minneapolis with an aggregate population of 350,000, because it is on the lake, while the others are inland towns. The man who invests his money with this absurd expectation deserves to lose it to the fellow who will make a better use of it. No merchant, who is now doing business at St. Paul or Minneapolis, will move 160 miles farther from his 350,000 customers, to get that much closer to the man in New York or Liverpool who is competing with others for possession of his crops and to sell him his stock of supplies.

The condition of things we have been considering is not confined to the American continent. It is a condition as long as trade and as broad as the world of commerce.

If men had looked no further than that little ancient island nearest to us on the European coast they would have discovered in Irish ports an illustration of the requirements of commerce so plain, so emphatically pronounced, the lesson seems extended towards us on the outstretched arm of Providence. The ports are simply the commercial ports of the regions in which they are found; that is to say, they do not control nor are they controlled by any extensive

coast systems. They are each the port of an interior district, drained by the rivers on which they stand. So we find Galway, Dublin, Dundalk, Wexford, Belfast, Sligo and Cork, the farthest points inland on the bays of those names to which a ship can go, while Limerick is at the head of ship navigation on the Shannon, and Londonderry is above Lough Foyle and several miles up the Foyle River.

While Liverpool, the port and mart of an immense coast system, is but three miles up the Mersey, but not too far removed from its customers, London, peculiarly the port of England's interior territory, is at the head of navigation on the Thames.

Glasgow, on the Clyde, owes its wonderful prosperity to its position at the head of navigation—an artificial harbor, made practicable by its propinquity to the coal and iron of the country. When I was a boy, a man of my present stature could have waded the Clyde at Glasgow, without wetting his shoulders, and to-day no ship engaged in general commerce fears to charter for that port. Seventy years ago, everything going up the Clyde made for Greenock, now scarcely more than an outside ward of Glasgow.

Time was, when men thought to build a port on the Elbe, below Hamburg, and Altona was started as a rival to the great capital. It was nearer the ocean than Hamburg, and therefore easier to reach; it had the backing of a patriotic, ambitious government and for a time did seem to threaten the existence of the ancient port. But observe the perverse temper of commerce. Ships pass by the convenient port of Altona to enter the docks of Hamburg, and Altona has become only the suburban home of the successful retired Hamburg merchant.

A sufficient statement of fact has now been presented to justify a consideration of the premises that immediately determine the location of a commercial port or great mercantile centre.

The producer of a given region, whether artisan or farmer, will deliver his wares at such point as will entail on him the least cost of transportation; he will go to the port by the shortest road, as measured by commercial distance, in which not alone the geographical mile is the unit, but the mile multiplied by the cost of movement.

Again, there is never competition to sell among producers. Hence they are outside the struggles of trade; they are not found crowding forward toward the purchaser, the agent of the consumer, the exporting merchant. Indeed, the chances are that crops will be sold in the first instance on the soil that bore them.

If producers were competitors, commercial towns would be pushed toward the sea to catch the first chance at the customer from abroad; and farmers, turned speculating capitalists, would become the originators and managers of railroad lines. But, on the contrary, the agents of the consumers, the merchants who send the crops abroad and import the goods they barter in exchange, are the men who jostle each other in the marts, who push into the interior of a country, to get as near to the field of produce as they can reach.

Thus it is that a great commercial city cannot be reared near the coast at any site which a large ship can pass, and sail nearer the producing region to load or even to unload. A new port may be built farther inland than a port already existing, as in the case of Glasgow, provided that in so doing it gets nearer the producing centre, which is the object of the old port; but a new port cannot be successfully removed from such a centre and placed nearer the ocean; it cannot thus injure the original port. It will, possibly, become a convenience, like the area door of a man's residence. It cannot reach a higher dignity.

From all these elements, I deduce the proposition, which I venture to call a law in political philosophy, that *the commercial port of a region will be as close to the producer as it is possible to go, and obtain reasonably good facilities for the class of transportation demanded by the produce of the country.*

I say this is the law; I believe it to be the inexorable, immutable law, without exception in the world's economy.

In accordance with this law, Montevideo, on the outer coast of Uruguay, has a population of 175,000, while Buenos Aires, a hundred and thirty miles up the river, contains 600,000 inhabitants. Guayaquil, in the edge of a sickly swamp of Ecuador, might have been healthily placed forty miles down stream, at a point famed for its salubrity, imposing forty miles less of river navigation, with equally good facilities of anchorage and discharging cargo; and better potable water for a population. The expense of transporting the products of the country, by the agency of native boatmen on balsas or in canoes, to a situation where whites can live without fear of malignant fevers would be trifling indeed; but such a course would separate the speculator from his game, the cacao, hides and woods of the country, and the merchant from his customers, the producers of those articles, by all that distance of forty miles, letting some braver adventurer cut it short and pitch his camp at his

customer's door, though the Angel of Death stood guard there, with the two-edged sword of yellow fever and small-pox.

I have said that "a great commercial city cannot be reared near the coast at any site which a large ship can pass and sail nearer the centre of production to load or even unload." At first view the statement seems inapplicable to New York, because the Hudson is navigable for large ships a hundred miles or more above that city; but this isolated fact does not contradict the law. If New York were simply the commercial port of the Hudson River valley, the objection to the law as stated would hold good. But the truth is it was not the port of that valley until the importance of its relation to a grander producing territory forced tribute from or absorbed every community within its reach. Albany, settled in 1614, was the all-sufficient port of the upper Hudson until increased population gave the region a foreign commerce, and then Hudson, at the head of ship navigation, 116 miles above Manhattan Island, became the port of the valley, maintaining an amount of shipping superior to that of our great metropolis, and carrying on trade with the West Indies and Europe, in addition to its whaling and fishery enterprise. But the valley is restricted in breadth; there was no great extent of country to seek its waters; going up the Hudson was not going inland, in the sense of approaching the heart of any great producing region.

The birth of New York in 1623 was an existence quite independent of the river valley. It was the centre of an immense coast system, including Manhattan, Long and Staten islands; New Jersey, directly west, and the shores of Connecticut. The valleys of the Passaic and Hackensack and all the country back of the precipitous west bank of the North River found the Manhattan port more accessible than any other point.

Meanwhile, Elizabeth and Newark became the centres of promising agricultural and manufacturing districts, and naturally brought their commercial exchange to New York as the nearest market. But, as late as 1820, the population of Philadelphia, so much nearer the heart of production, was greater than that of New York and remained so, until work on the Erie Canal had progressed three years and made the canal a certainty. The belief in this certainty gave impetus to values immediately along the line and in the valley of the Hudson. When the canal was opened, New York was moved just so much closer to the interior, and the merchant of the city sent forward his agents to buy up grain and ship to his port, so that if Liverpool, London and Hamburg had been the principal

grain markets of the world, New York now entered into the same category, and its population was doubled in the decade that saw the canal finished.

New York, therefore, is not simply the commercial port of the Hudson River valley, but of half the continent, and owes its position, not to its accessibility from the ocean, but to its central location with relation to the producing region directly west and southwest, as well as northwest.

It has been urged that "on the Pacific Coast there is the case of San Francisco. That city lies close to the ocean. Apparently it is removed from all producing country and owes its commercial position to its accessibility from the ocean. Before the introduction of hydraulic mining, good-sized vessels could go up to Sacramento and the largest class of vessels still take their cargoes up to Benicia and load there for return, with the products of the San Joaquin valley. If we look no farther, we shall say that on the basis of what has been here claimed to be law, Sacramento, which is in the heart of the great valley of California, and which is as much nearer to the mining districts as it is to the agricultural region, ought to be the commercial metropolis of California, and the Sacramento River should have been improved instead of being allowed to deteriorate. If, however, the difficulties of river navigation seem too great, then a great city ought to have grown up at Benicia, or at some point above that site. The facts are precisely the reverse. San Francisco, nearer the ocean than any point named and farther from the centre of production, has become a great commercial metropolis in violation of what has been proclaimed as a natural law." This was the argument. This view is, however, extremely superficial.

On close analysis of the case we find San Francisco occupying a situation much like that of New York, in being the centre of an extensive coast system. It forms no exception to the general law, nor even a modification of its absolute truth.

Sacramento is the port of the upper river as Benicia is of the lower, receiving the products of the San Joaquin Valley. Tributary to them is a population of 250,000 inhabitants.

But San Francisco is the port of a distinct region. It is not only the convenient harbor of all the lower bay with a population of 250,000, outside its own municipal limits, but is the only first-class harbor of all the coast between Monterey and the Columbia River, a region with an additional population of 400,000 souls.

As the little ports along the coast bring their tribute to a mart

in light sloops and schooners, they must find a harbor as near at hand as possible, precisely as the inland producer finds his port. This they have found in the Bay of San Francisco, as close as possible to the ocean and therefore for them as close as possible to the producing territory, and therefore as close as possible to the north and south ocean coast. And so San Francisco is located where it is, not to be accessible to the ocean, to Yokohama and Hong Kong, nor yet to the Sacramento Valley, which has its own port, but to the numberless little inlets along the Pacific shores north and south of there, which ship their products in small vessels to the nearest great harbor. If San Francisco did not exist a great port for the reason thus stated, it would not exist at all.

Like New York, being the centre of the varied products from a vast area, San Francisco has become a convenient manufacturing point and the port of a population of about a million souls, not including the Sacramento and San Joaquin valleys. On this account it has become a commercial mart as well as port, and has thereby absorbed the capital of all the interior river ports. Without New York and San Francisco, the valleys above them would ship directly to Liverpool or some other great market of the world. That has become unnecessary; they find the market at their doors, and ship to New York and San Francisco from their own upstream local ports.

It has been said in the discussion of this problem and in opposition to my solution, "that San Francisco is separated from the whole agricultural portion of California." So far is this from being the truth, that if we consider the Sacramento and San Joaquin valleys fairly tributary to Benicia, while the shores below Benicia and the sparsely settled coast are tributaries of San Francisco, the value of farms in the former district according to the last census is less than \$180,000,000 as against \$170,000,000 in what is called the "inferior" farming country, while in manufactures the valleys produce \$24,000,000 a year to be offset by \$172,000,000 produced by the manufactures of San Francisco Bay and coast.

It seems safe, therefore, to say that San Francisco has a *raison d'être* quite in accordance with the law as I have stated it.

Liverpool seems to be another exception to this law. Liverpool is one of the great markets of the world. It owes no considerable part of its mercantile importance to the trade of the Mersey. It is also a great coast centre, reaching out to the Irish as well as the English coast. It is especially the port of Ireland, one-third of its population is Irish, and but for the immense expenditure in docks

would be as independent of the caprices of capital for prosperity as any other city.

It has been said that the Manchester Canal is a failure because it should have removed the port to Manchester from Liverpool. This is supposing that the producing region of which Manchester is the centre is greater either in area or importance than that tributary to Liverpool, which is not the case. Manchester has been brought nearer to Liverpool by the canal, as Buffalo to New York by similar means, and one exceedingly important result has been that Manchester merchants are receiving their goods from abroad and are transacting all their business with Liverpool at a vast saving over prices pre-existing; because, if the canal does not execute the work, it is there as a standing menace to keep the railroads in order. It has had this effect in a remarkable degree, just as the Erie Canal has influenced the freight rates of the New York Central Railroad. This being the case, it matters little whether the canal does the carrying or not; it answers the end for which it was constructed, in giving the Manchester man all the relief for which he prayed.

Another extraordinary result is that a solid city is concentrating in the thirty-two miles of country between Liverpool and Manchester.

The map of South America shows a remarkable number of ports close to the ocean, when apparently they might better, in accordance with the law here presented, have been planted, geographically speaking, further inland; the fact seems to offer encouragement to the projects I have ventured to condemn.

Pará and Rio are prominent ports of the class in mind. It is true that Pará is 80 miles from the ocean. It might have been 600 miles farther up stream and have equally good accommodation for ships that seek its anchorage. It was located where it is, for several reasons. At a point 80 miles up stream, it is as far as it is possible to go and find a salubrious location, the soil at that spot being sandy and especially free from miasmatic poison. But this fact would not alone have weighed in its location, for men brave death in battle for the wages of the soldier. It was carried up there instead of locating it nearer the sea or farther up stream, for the purpose of getting as close as possible to the rich productive centre of the Province of Pará, which is unequalled in the wealth of its vegetable production. The Province of Pará is fairly well settled for Brazil. But the upper valley of the Amazon is still a wilderness, although along its course are many towns, the centres

of exchange for limited districts. Pará is at the mouth, also, of the Valley of the Guamá. Thence it receives the trade of a rich district and is the market of the rubber brought from the upper valleys. I have no idea that any other town, the peer of Pará, will ever rise to rival it in any part of the vast valleys of the Amazonas, because no town will have its site near so rich a centre of production as the Province of Pará and the Valley of the Guamá. It will therefore become a great metropolitan mart as well as port.

Rio de Janeiro has been mentioned as a commercial metropolis near the ocean. It is on a bay extending inland about 18 miles from the sea. The city is on the west bank four miles from the entrance. Apparently it might have been placed much nearer the interior. Now the interesting fact is that the original town was on the other side of the bay, close to the ocean at Nictheroy, and was moved to where it now stands to be more accessible to the interior. It is on the only flat in that precipitous shore, from which an accessible pass leads through the mountains to the interior, the Province of Minas Geraes, the most populous and best cultivated province of Brazil. At the same time it is accessible to the coast province of Rio de Janeiro, with a population of 1,000,000 souls. Rio has thus become one of the great markets of the world. Its exports equal in value those of all the rest of Brazil combined. It therefore occupies, in relation to Brazil, much the same position that New York holds with relation to the commerce of North America, having like New York an immense coast trade.

Observing the coast of the Guianas, we find nearly all their important ports near the ocean; accordingly we learn that their settlements are also along the coast. It is true that Paramaribo in Dutch Guiana is ten miles up the Surinam River, and Dutch Guiana is exceptional, in that its settlements have extended up from the coast on that stream. Georgetown, of British Guiana, is at the mouth of the Essequibo River on which there are many settlements; but they have not kept pace with the settlements on the more salubrious coast, and therefore Georgetown is put where it can best reach its more valuable class of customers.

Cayenne, at the mouth of the Oyac River, is a French penal settlement. Its location has no relation to trade, but it is nevertheless the port of French Guiana, placed where it can best be reached by the vessels that convey criminals from France.

I repeat that only the coast of the Guianas presents inducements to settlers, the interior being insalubrious.

It will be observed that Maracaibo, in Venezuela, is at the head

of the Gulf of Maracaibo. Apparently it should have been placed farther inland at the head of the lake, which is simply an extension of the gulf. The truth is that a bar at the mouth of the lake, where it enters the gulf, prevents the more desirable location, so that Maracaibo is really at the head of navigation. If the region prosper, so that in time it will repay commerce to remove the bar, then the port will undoubtedly go to the head of the lake.

Cartagena, in Colombia, is on the ocean coast like Galveston. Its history, like that of Galveston, indicates the progress of settlements in that part of the Republic. Two ports have been started to do that which Cartagena has failed to do, *i. e.*, furnish proper facilities for accommodating the new condition, by reaching the customers of the men who conduct the trade of the region. Santa Marta was started with the idea that easy access from the ocean was the principal requirement for a port, and being located under the influence of this blunder on the coast, attained to a population of barely 4,000 living on a trifling coast trade, while Barranquilla, fifteen miles up the Magdalena River, near the producing centre, has already a population of 21,000, being more than twice that of the original port, which has dwindled to 9,000 and is still decreasing.

Angostura, also known as La Ciudad de Bolívar, on the Orinoco, is 240 miles from the mouth of that river. Vessels of 300 tons go up there under sail against a strong current. Still it is by no means at the head of navigation. It would be as easy to go farther up as to go to Angostura. But at the distance now reached commerce is at the gate of the region it seeks. There it is the treasure is found in the customers of the best producing district yet settled, and there it remains to barter its goods for the produce of the country.

The South American continent is not yet peopled. It has scarcely begun the progress of the century, and the future is all before it. A great future it will surely be, when the northern half of the hemisphere is filled with its rapidly multiplying millions, and their influence has forced real liberty on the governments of those states now under control of a debased ecclesiastical system. At the present time many of the South American ports hold to the country just the relation held by the port of Boston, before the settlement of the interior brought other cities to the front, when Boston was the most important commercial city in North America.

The direction of trade routes, barely touched in discussing the relative positions of New York and Boston, is an important factor

in establishing and maintaining the commercial metropolis of a region. It was mentioned that Boston capital had tapped the country north of New York in the hope of drawing off the trade of the West to itself. The result of the Western railroad has not been what was expected of it. Troy and Albany are nearly at equal distances from New York and Boston, but the immense capital of the Eastern city failed to seize the products of the West. The enterprising Bostonian saw that a mountain intervened, and he pierced the obstacle, reducing the difficulties of transportation to their lowest terms. Still he has to contend against one radical truth, which he is either ignoring or striving to eliminate from existence by persistent employment of capital. This truth is that trade follows natural channels; that the staple products of the soil and all the coarse minerals will reach the coast by the route that permits the easiest movement with the least artificial aid, generally the lines of drainage of a country. The trade of a region will not cross a great valley even to reach a market of the first importance. It will either create centres of exchange in such valleys or, having reached them, follow down their course to a port. Thus, Western produce reaching the Hudson River will follow that stream to New York for exportation, as the produce of the immense Mississippi Valley goes to New Orleans and not to Mobile.

In the Northwest, the relation of Portland, on the Willamette, to Puget Sound closely resembles that existing between the ports of New York and Boston. Portland occupies the site of a great commercial centre for an immense region, the entire basin of the Columbia River, of which 160,000 square miles are within the limits of the United States. All the country west of the Rocky Mountains, tributary to the Northern Pacific Railroad and seeking an outlet on the western coast, will, on going that way, make the mouth of Snake River, on the Columbia, a common point of departure for Puget Sound as for Portland; from that point the trade will either descend the great valley or, proceeding along the line of railroad, cross the Cascade range and enter the Puget Sound district for a harbor.

The lineal distance in either case is about the same. The commercial distance is greatly in favor of Portland. In this case there is a descent of 300 feet in favor of west-bound traffic going to Portland. There is only this ascent in going east. On the other hand, there is a summit of 2,400 feet to be overcome by west-bound traffic and 2,700 for that east-bound, besides the sinuosities

of a severe mountain line and the income demanded by increased cost of constructing it with fairly practicable grades.

And yet intelligent men believe it possible to remove the commercial metropolis of the region from the spot on which nature located it and transfer it to Puget Sound, because they have planted capital there for such a purpose.

A distinguished advocate of this remarkable system of supplanting commercial centres and centres of exchange declares with some emphasis that "the commercial ports of the world were established before the existence of modern facilities for transportation; having become established and capital being located, they have maintained their positions as commercial centres, although we cannot say they would have been so located if the railroad systems of the country had first been built." The statement is an important one, because it is precisely the sort of reasoning that has led to a vast dissipation of capital. The truth is, and this statement is one proof of it, that the commercial ports of the country have grown up in accordance with natural law, when men were without artificial means to help them; they are therefore instinctive or intuitive locations. So true is this that one cannot state the case of a new commercial port, started by the influence of capital and railroads in rivalry or opposition to one of the old ports, that has been a success, that has not, indeed, been a pronounced failure, and there are many such attempts. It would be impossible to mention a commercial port the relation of which to its neighboring ports has been changed by the influence of railroads. Certainly, railroads have increased the commercial wealth and machinery, but they have not diverted, and I dare to say they never will divert, trade from the direction of its natural channels.

Every new commercial port undertaken by railroad capitalists has been a failure in reaching the fulfillment of its promises, and such enterprises must continue to be failures.

Ports will be established by trade and by trade alone. The railroads do not make the trade of the country; they are the offspring of its trade. Trade exists without railroads, but railroads cannot exist without trade.

THE AMERICAN ASSOCIATION.

FIFTIETH ANNIVERSARY.

The American Association for the Advancement of Science celebrated the fiftieth anniversary of its organization by holding an unusually large and important meeting in Boston, the city of its birth. The first General Session was held on Monday, August 22, and the meetings were continued throughout the week.

In 1847, the parent association—the American Association of Geologists and Naturalists, which was organized in 1840 as the Association of American Geologists—held its annual meeting in Boston under the presidency of William B. Rogers. At this meeting it was decided to enlarge the scope of the Association by the adoption of a new constitution that should embrace all branches of science and admit all lovers of science. The present Association was, therefore, organized in Boston, although its first regular meeting was held in Philadelphia, in 1848, under the presidency of William C. Redfield. For two years the meetings of the Association were held in the South in the winter and in the North in the summer; and as they were suspended for five years, during the period of the Civil War, the fiftieth anniversary thus occurred at the forty-seventh meeting.

At the first General Session on Monday, the retiring President, Professor Wolcott Gibbs, of Harvard University, presided and called upon the Rt. Rev. William Lawrence, Bishop of the Diocese of Massachusetts, to offer the opening prayer. Addresses of welcome were made by His Excellency Roger Wolcott, Governor of Massachusetts; by His Honor Josiah Quincy, Mayor of Boston; and by Professor James M. Crafts, President of the Massachusetts Institute of Technology. Professor Wolcott Gibbs then introduced Professor F. W. Putnam of Harvard University, the President of the Boston meeting, as one who had served the Association for twenty-five years as Permanent Secretary, and who had achieved high distinction in his own special branch of science—American archaeology and ethnology. Professor Putnam received a prolonged and hearty greeting from the members of the Association, among whom he has made hosts of warm friends during his long service as their executive officer. He accepted the presidency of the Association as the highest honor that could be bestowed upon him, and was especially gratified at receiving it from a founder of the Association. After replying

to the addresses of welcome President Putnam gave a brief summary of his thirty-three years' connection with the Association, and called upon all young scientists to follow his example and become members that they might receive the benefit of contact with the great minds in science. He referred to the extreme specialization in science which he considers the main cause of the decrease in the membership of the Association during the past few years, and he urged all specialists and members of special societies to join the parent society, where they could do such good work in the general advancement of science by throwing light upon the problems coming under their special research. At the close of his remarks President Putnam called upon M. Désiré Charnay, the representative of the French Government to the Jubilee Meeting of the Association. M. Charnay spoke briefly in French. President Putnam then read a message from the Russian Geological Committee of St. Petersburg extending to the American Association respectful congratulations and good wishes.

In the afternoon eight vice-presidents delivered addresses before the respective sections. Vice-President Cooley, Chairman of Section D, had been called to active service in the Navy, and sent word from Santiago, Cuba, regretting his inability to be present at the meeting.

In Section E (Geology and Geography), Professor Herman L. Fairchild, of the University of Rochester, delivered his vice-presidential address on the subject, "Glacial Geology in America." He considered this fiftieth anniversary of the Association an appropriate time for a general review of the progress of the glacial theory in America. "The life of this Association with that of its predecessor covers precisely the period since the glacial theory was introduced to American geologists. . . . The reports of the early State geological surveys, the transactions of learned societies and the volumes of Silliman's Journal, to about 1850, contain frequent reference to 'diluvial drift,' 'diluvial scratches,' 'tremendous currents of water,' and terms of similar import. The first suggestion of ice as a contributory agent in the genesis of the drift, in the form of ice-bérgs or ice floes, was made by Peter Dobson of Connecticut in a letter to Silliman, dated November 21, 1825. The first American geologist to give a favorable reception to the glacial theory of Agassiz, as far as printed reports show, was Edward Hitchcock, in his presidential address before the Association of American Geologists and Naturalists at their second annual meeting, held in Philadelphia, April, 1841. Unfortunately for truth and for American

geology the circumstances and scientific forces of that time did not allow him to stand upon the advanced ground he had taken," and for ten years afterward no American geologist ventured openly to adopt and proclaim the theory of Agassiz. The force of theological opinion was against the glacial theory. "The hypothesis invoking water as the drift agency might be harmonized with the belief in the Noachian deluge, but the Bible gave no countenance to an ice deluge." In 1846 Louis Agassiz arrived in America; and in 1848, at the first meeting of this Association in Philadelphia, "he described the glacial phenomena about Lake Superior, showing the identity of the phenomena in America with those in Europe." The reception of the paper was not encouraging; and Agassiz did not present another paper before the Association until 1870. But from about 1850 the glacial theory began to gain ground, the younger generation of geologists being less prejudiced against the new theory. The periods in the history of drift-study in America are as follows:

"Undisputed reign of diluvial hypothesis—to 1841.

Discussion of the glacial hypothesis—1841 to 1848.

Gradual adoption of the glacial theory—1849 to 1866.

Development of glacial geology—1867 to date."

The remaining portions of the address were devoted to a study of the "Ice Body; The Glacial Period; Interpretation of Special Phenomena,—drumlins, moraines, eskers, kames, kettles, valley drift and terraces, loess, lake basins and pre-glacial drainage, glacial lakes;" and "Existing Glaciers." In closing, Professor Fairchild suggested that the glacial geologists should give up the use of the word "theory," since "it is no longer a theory but an established fact."

On Monday evening the retiring President, Wolcott Gibbs, delivered his presidential address before the Association on the subject, "Some Points in Theoretical Chemistry."

Following the plan of the Boston Meeting of 1880, the Association accepted an invitation from the Essex Institute to spend one day in Salem, and another from the Corporation of Harvard College to spend one day in Cambridge. On Wednesday, "Salem Day," no sessions of the sections were held. The members were taken by steamboat or train to Salem Willows, where they were received and welcomed by the officers of the Essex Institute and the Mayor of the city. A little after noon an old-fashioned New England fish dinner was served, and in the afternoon the members were con-

ducted by guides to the several points of interest in this old historic city. The largest party visited the Essex Institute and the Peabody Academy of Science, while others were shown the records and relics of Salem witchcraft, the haunts of Hawthorne—including the House of Seven Gables—the ancient architecture, old cemeteries and educational institutions. The party returned to Boston late in the afternoon and in the evening listened to lectures on the Metropolitan Water Supply, by Hon. Henry H. Sprague, chairman of the Metropolitan Board; and on The Transit in Boston, by Hon. George G. Crocker, chairman of the Transit Commission.

On Friday, "Cambridge Day," only a few of the sections held sessions in Cambridge. The various departments of Harvard were open for inspection, and officers of the various scientific institutions were present to give information. Lunch and tea were furnished by Harvard College in Memorial Hall. In the afternoon, Section H held its largest session in the lecture room of the Peabody Museum. On this occasion Mr. Frank La Flesche of the Indian Bureau, read a most important and interesting paper on "Ritual of the Sacred Pole of the Omahas." Mr. La Flesche presented a vivid picture of his own childhood as an Indian boy, and of his participation in the ceremonies connected with the Sacred Pole of the Omahas. He described his interviews in after years with the aged keeper of the Sacred Pole, and told how he finally persuaded the keeper to allow it to be transferred to the Peabody Museum, where he promised it should be kept for all time as a sacred relic of the tribe. The songs connected with the ritual of the Pole were in part sung by Mr. La Flesche and partly given on the graphophone from records which he had secured from the old Indian keeper of the Pole during his visit to the tribe this past summer.

In the evening, Dr. Charles W. Eliot, President of Harvard University, delivered an address in Sanders Theatre to the members of the Association on the subject, "The Destructive and Constructive Energies of Our Government." By request of the Council, this address will appear in full in the Volume of Proceedings of the Boston Meeting.

During the week of the meeting, 443 papers were read in the several sections, and many were of unusual importance. It will be possible, within the limits of this brief report, to notice but a few of those bearing upon some branch of geographic science, while others of equal importance will necessarily be omitted.

In Section H, Miss Alice C. Fletcher gave an illustrated paper on the "Significance of the Garment, a study of the Omaha Tribe."

This paper, like all Miss Fletcher's contributions to ethnology, gave the results of personal observation and study during her long residence among the Indians. The lantern pictures showed the different modes of adjusting the blanket as indicative of different moods and actions. The following summary will give an idea of the substance of the paper: "We have found the garment to have been an invention by which man's self-consciousness could be emphasized. Its practical uses were subservient to this primary purpose. We have noted that man's self-consciousness was born of attrition with his fellows, that his use of garments indicated not only the birth, but the development, of his conscious personality, that they expressed his relations to the unseen world, that they came to characterize his experience and exploits, to mark his place and obligations in society, and finally his freedom in personal expression."

Dr. Wolfred Nelson, a Fellow of the Royal Geographical Society, read a paper in Section I on "Cuba: its Past, Present and Future." Dr. Nelson has lived for some years in Cuba, and he spoke from personal observation. After presenting a geographical description of the island, he said that about one-half of the area remains almost a virgin forest. He referred to the native woods, including mahogany, hard cedar, ceiba and ebony, and dwelt upon the mines and minerals of the island, especially in the province of Santiago de Cuba. He spoke of the abundant crops of fruits and vegetables, and described the beauties and the dangers of the climate. In conclusion, he said, "Knowing that island as I do, I fear that an independent Cuba will be an impossibility. As an American colony she will blossom and bring forth her increase. Then, and then only, will the black plague of central and eastern Cuba cease to be a nightmare. It is a question of time. Cuba will be the brightest spot in the colonial possessions of the United States. Old conditions have passed away. This great and glorious republic must face her destiny."

An extremely interesting paper read in Section E was by Dr. Horace C. Hovey, of Newburyport, Mass., on the subject "The Region of the Causses in Southern France," illustrated with maps and stereopticon views. From his interest in the study of caves Dr. Hovey was led to join an expedition under the leadership of M. Edouard A. Martel. Les Causses is the name given to lofty table-lands in the Departments of Lot and Lozère, along the western declivity of the Cevennes Mountains, "causses" being from the Latin *calx*, meaning limestone. The Causses vary in height from 1,000 to 5,000 feet above the sea. The caverns form one of

the most remarkable features. There are several hundred, some inhabited and others used as sheepfolds. A few are quite new geologically and others are very old. The paths to them are along terraces or from the overhanging cliffs. They are almost exact counterparts of the cliff dwellings of our Southwest. From one of these caves 300 prehistoric skeletons have been taken. Another cave has nine vertical pits locally called "wells," which are from 40 to 130 feet in depth. The stalactite decoration of the caves is remarkably fine. This region has been almost wholly unknown, partly owing to the superstitious dread of the peasants; but now, under the stimulus of the Société de Spéléologie, it will soon become better known.

Professor G. Frederick Wright in Section E gave a paper on "The Age of Niagara Falls as indicated by the Erosion at the Mouth of the Gorge." The author referred to a remark of the late Dr. James Hall that "the outlet of the chasm below Niagara Falls is scarcely wider than elsewhere along its course." This he considered important evidence in support of the theory of a shorter duration of time since the glacial epoch than has generally been estimated. Professor Wright was greatly strengthened in this opinion by his investigations this summer, since he found that the disintegrating forces tending to enlarge the outlet and give it a V-shape are more rapid than has been supposed. He concludes that at the lowest estimate twelve thousand years only would be required for the enlargement of the upper part of the mouth of the gorge, a thousand feet on each side, which is largely in excess of the actual amount of enlargement. He believes the gorge cannot be much more than ten thousand years old.

Professor J. W. Spencer, of Washington, D. C., gave a paper on "Another Episode in the History of Niagara River," which was a sequel to that read before the Association four years ago upon the "Duration of Niagara Falls." The writer gave a revision of the intermediate episodes in the history, while the Falls were receding from Foster's Flats to the point of the railway bridges. He stated that after the descent of the river reached its maximum of 420 feet (by the retreat of the Ontario waters toward the north), the return to the present amount of 326 feet was interrupted by the subsequent rising of the level of the lake in the gorge to the height of 75 feet, thus reducing the descent of the river to 250 feet. This rising of the waters was occasioned by the lifting of the barrier at the outlet of Lake Ontario to an elevation 100 feet higher than the present one. By the subsequent dissection of this barrier, partly com-

posed of drift, the descent of Niagara has been increased to 326 feet.

A second paper by Professor Spencer was on the "Evidence of Recent great Elevation of New England." It contained a description of the valley terraces illustrated by actual sections, showing that the declivities of the valleys are not by even slopes, but by a succession of steps, the plains of which become terraces farther down the valley. These steps are regarded as gradation plains in the changes of the base-level of erosion, and many of the corresponding terraces are hundreds of feet above the floors of the valleys. From those features it is not inferred that the elevation need to have been from below sea-level, and consequently the gravels are not claimed to have necessarily been of marine origin.

Professor B. K. Emerson, of Amherst, Mass., read a paper on "An Outline Map of the Geology of Southern New England." The map includes Massachusetts, Connecticut and Rhode Island, and shows first, the line of Archæan out-cropping rocks, which extend along the axis of the Green Mountains from the Hoosac Tunnel to the Highlands on the Hudson, and second, the eastern Archæan granite area from Southboro to New London. The order of the successive formations, the distribution from the second area of feldspathic material toward the northeast, and the later eruptions, which furnished softened matter to blend with it, were noted; also the deposition of great beds of sandstone and shales, the folding of these and their compression into gneiss and marble, and the later processes by which the present topography was produced.

Professor Thomas Wilson, of the United States National Museum, contributed a paper to Section H on the subject, "Art in Prehistoric Times." The speaker propounded and illustrated the theory that art has been the germ of civilization, rather than one of its results. Its earliest manifestation is seen in the works of the very earliest man of which we have knowledge through his archæological remains, palæolithic man. Hundreds of his relics, in flint, bone and tusk, have been found, mostly in the caves of Southern France. Some of these show a purely decorative engraving, and in some cases the article itself is purely ornamental. In the neolithic age man's art was of a different character, and almost purely decorative, being marked and incised in pottery and bronze. As this art was evidently for the simple purpose of giving pleasure to the eye, the speaker considers that prehistoric man had in a degree the purely artistic sense.

Vice-President Fairchild presented to his section a paper on "Basins in Glacial Lake Deltas." He described a curious kettle-hole in a glacial lake delta in New York. This basin is situated in a delta which was formed by the deposition of drift and rock in a glacial lake. The delta now forms a plateau 125 feet above the village of Potter. The basin occupies about one-fourth of the area of the plateau and extends to the very base of the deposit. The only satisfactory explanation of its origin is that an isolated block of ice was left here by the receding ice front, the delta material was piled around it, and the subsequent melting of the ice block produced the cavity.

A second paper by Prof. G. Frederick Wright described "A recently discovered Cave of Celestite Crystals at Put-in-Bay, Ohio." These crystals are of a delicate blue color, hence called "celestite." They occur in many places in Europe; but the principal locality in America from which the museums have been supplied with specimens is Strontian Island, in the western end of Lake Erie. Just as this supply was becoming exhausted, a remarkable fissure was discovered last winter in Put-in-Bay Island, which is completely surrounded with very large crystals of this beautiful mineral. The fissure was penetrated in digging a well seventeen feet below the surface. It is large enough to permit the entrance of ten or twelve persons at a time. It is not an ordinary cavern, but is apparently the interior of an immense geode lined with crystals of this mineral.

In a paper entitled "Burial Customs of the Ancient Zapotecs of Southern Mexico," Mr. Marshall H. Saville, Secretary of Section of Anthropology, gave a brief account of his recent explorations under the auspices of the American Museum of Natural History. At Xoxo, five miles south of Oaxaca, he discovered a group of pyramids or "teocallis," which had evidently been used for sepulchres. To the west of the principal "teocalli" is an oval mound and on the other three sides are oblong rectangular pyramids. A most important discovery was made in a chamber in one of the mounds to the northeast of the main "teocalli." The top of this mound was overgrown with vegetation and covered with ashes and potsherds. At a short distance below the surface was a cemented floor. Several feet below this floor was a stone wall, and cemented to this wall, above the lintel of a doorway which proved to be the entrance to a tomb, were several pottery vessels. Under each of these vessels was found an idol painted red. The lintel of the door was a slab of volcanic rock, about six feet long by eighteen inches wide, which was covered with strange hieroglyphs. On entering

the chamber, the walls were found to be covered with mural paintings in several colors. The designs were mostly draped female figures in kneeling postures. In the walls of the crypt there were three niches in which were several skulls and fragments of skeletons, all painted red. The entrances to the tombs were in several cases painted red, which seems to have been the mourning color of the Zatopecans. One little arrow head was the only implement or weapon found during this exploration. From the chamber of one of the crypts a terra cotta drain pipe extended far out into the fields. The joints were several feet long and accurately fitted. At Montalban, three miles from Xoxo, are the ruins of an immense structure, built on top of a steep hill, with sunken plazas and underground passageways and great circular pillars. This was evidently the principal fortified city of the ancient Zapotecans.

At a joint session of Section H and the American Folk Lore Society, Mrs. Jeanette Robinson Murphy gave an interesting paper on the "Survival of African Music in America." The paper dealt with African folk tales and superstitions and African songs. The music, as illustrated by Mrs. Murphy from her recollections of her youth in a Southern home, was weird and strange. The folk tales were given in the quaint negro dialect.

Miss Cornelia Horsford presented to the Association the "Evidences that the Norsemen were in Massachusetts in pre-Columbian Days." "These evidences are divided into two series, one geographical, the other archæological." The geographical evidences were shown by taking the description of Vineland in Icelandic literature and applying it to the coast of North America. The archæological evidences were shown by comparing the sites of habitations uncovered in Cambridge on the banks of the Charles, "which correspond with the description of the sites of Thorfinn's and Karlsefni's houses, with work belonging to the Saga-time in Iceland." These remains were also compared with the American works most nearly resembling them in post-Columbian days, "showing that they are essentially like the ancient Icelandic work, and unlike the work of either the native or post-Columbian races on this coast."

Professor B. E. Fernow, formerly Chief of the U. S. Forestry Division, gave before Section I an account of the new "College of Forestry at Cornell University," of which he is the Director. He said that the establishment of this College of Forestry marked a greater development in the science and art of forestry than could be shown in any other direction, since this science was not known,

even by name, fifty years ago, when this Association was organized. Moreover, a memorial to Congress from this Association, twenty-five years ago, led to the establishment of the Division of Forestry in the U. S. Department of Agriculture, which was the first recognition of the science in this country. The handling of slowly maturing crops like forest trees, the speaker said, is a problem wholly unlike any other presented to the business man. The motto of the forester is not "Woodman, spare that tree," but "Woodman, cut those trees judiciously." The aim of the College of Forestry will be "to pull up the stumps of ignorance regarding forests and forestry and to educate professional foresters." The courses leading to a degree of Bachelor in the Science of Forestry occupy four years, of which the first two are devoted to the study of fundamental and supplementary sciences, including mathematics, physics, chemistry, geology, botany, entomology and political economy. The school forest will consist of 30,000 acres in the Adirondacks.

The well-known traveller, Paul Du Chaillu, an invited guest of the Association, gave the members of Section H a paper on "The Norsemen, the Conquerors of Britain." Archæological evidence was brought forward to overthrow the idea that the English-speaking people are descendants of the Anglo-Saxon race. The word Saxon might have come from the name of a weapon, called "sax," which was extensively used by the Norsemen. Proofs were given that the seafaring tribes of the Romans were Norsemen, and reference was made to the exploration of a grave on the river Cam, in England, where "everything was of Norse origin or manufacture, similar to what is found in Norseland." Among these were found Roman coins dating from the year 80 to 220 A.D., which showed plainly that "the Norse tribes were already in Great Britain during the Roman invasion of the island." The speaker regards the Anglo-Saxon race as a myth, and says we should ask the historians to show us their archæology and tell us what country they came from. He believes that we are in great part descended from the Norse race.

At the same session, M. Désiré Charnay, the delegate from Paris, in a few remarks on "The Disappearance of the Cliff Dwellers," advanced the theory that the cliff dwellers were exterminated by the warlike Indians after the latter had acquired the use of the horse, about the end of the seventeenth century. This was as yet no more than a theory, but he thought it might be found to deserve the attention of students.

As befitted the fiftieth anniversary of the Association, the Boston Meeting, according to the report of the new Permanent Secretary, Dr. L. O. Howard, was in many respects the most successful in the history of the organization. Nine hundred and ninety-three members were in attendance, Massachusetts furnishing the largest number, 231; New York the next, 158, and the District of Columbia, 96. Taken together with the members of the affiliated societies, it was the largest gathering of scientific persons ever held in the United States. Among those present there was an unusually large number of noted persons, including nine of the past presidents. There were sixteen members from British North America; an official representative from the French Republic; three guests from Great Britain; one from New South Wales; one from Brazil, and one from Japan.

The Boston Local Committee received words of praise from all sides for the perfection of its elaborate arrangements, so smoothly and successfully carried out, for the entertainment and comfort of the members and guests of the Association. The several receptions and excursions formed an exceedingly attractive feature of the meeting.

A number of interesting publications, which had been prepared especially for the occasion, were presented to the members in attendance at the Boston Meeting. These included an illustrated "Handbook to the Principal Scientific Institutions of Boston and Vicinity," with chapters on Harvard University, Massachusetts Institute of Technology, Boston University, Tufts College, Wellesley College, Boston College, The Lowell Institute, American Academy of Arts and Sciences, Boston Society of Natural History, Massachusetts Horticultural Society, Appalachian Mountain Club, Museum of Fine Arts, Blue Hill Meteorological Observatory, Boston Public Library, Boston Athenæum, Boston Medical Library, Park System, Metropolitan Water Works, Metropolitan Sewerage, Transit in Boston, Geology and Geography of the Boston District and Places of Historical Interest. Another pamphlet was an illustrated "Guide to Localities illustrating the Geology, Marine Zoölogy and Botany of the Vicinity of Boston," containing contributions from five professors and two instructors in Harvard University, Amherst College and Massachusetts Institute of Technology, on the Geology, Physiography, Marine Algæ, Petrography, Marine Invertebrates, and Palæontology of the region. A "Guide to the Peabody Museum of Harvard University" gave a brief description of the Museum, calling attention to the chief points of

interest in the several halls; and a "Guide Book to Harvard University" gave descriptions and illustrations of the principal buildings and points of interest in connection with the University.

The meeting of 1899 will be held in Columbus, Ohio, under the presidency of Professor Edward Orton, President of the Ohio State University. Professor Putnam, the retiring president, will give the presidential address at the Columbus meeting.

RECORD OF GEOGRAPHICAL PROGRESS.

AMERICA.

MOUNT ILLIMANI ASCENDED.—Sir Martin Conway left England for Bolivia early in the summer for the purpose of exploring the high group of the Andes containing the peaks Illimani and Illampu (Sorata). A despatch received from La Paz, Bolivia, on Sept. 14, announced that Conway had succeeded in reaching the summit of Illimani, which he found to be 22,500 feet above sea-level. He was accompanied by the guides who ascended Mount St. Elias with the Duke of the Abruzzi in 1897.

The highland region in which Sir Martin Conway is working, although not the culminating point of the South American Continent, contains at least the groups of peaks and domes which have the greatest mean altitude. Illampu and Illimani were both known to exceed 21,000 feet in height, and they indicate with sufficient accuracy the central point of the whole Andean system: while the central points of the northern and southern sections of the Cordilleras are similarly indicated by the other loftiest summits of America—in Ecuador, by Chimborazo, long supposed to be the highest mountain in the world, and in the Argentine-Chilian Andes by Aconcagua, the culminating peak of the New World. Mount Illampu is known to overtop Illimani, but the latter summit, though the second highest of Bolivian peaks, is still first in its imposing aspect and variety of outline. Its base is encircled by tropical plantations, while higher up grow the forests and crops of the temperate regions, and above this zone, high beyond the clouds, rise its three snowy peaks, one of which was scaled by Wiener in 1877, and by him named the Pic de Paris. It is not, however, the culminating point of the mountain, which is supposed to be the peak that Conway has now ascended.

A PECULIAR SOUTH AMERICAN TELEGRAPH.—The *Geographical Journal* (July, 1898) prints some interesting notes by Col. Church on the visit of Dr. Bach of La Plata, Argentina, who has made extensive explorations in remote parts of the Amazon Valley, giving special attention to the habits and customs of its tribes. Among the Catuquinárú, whom he visited in 1896-97, he found an extraordinary telegraphic apparatus called the *cambarysú*, which these

Indians use. One of them is hidden away in each hamlet occupied by the tribe. A hole is excavated in the ground, about half of which is filled with coarse sand, while above this, almost to the surface, are layers of fine sand, wood and bone fragments and powdered mica. These layers are in a case of hard palm wood which extends above the surface, and there is a hollow space between the underground layers and layers of hide, wood and hard rubber that make the upper part of the apparatus. The rubber top of the contrivance is struck with a club, resembling the stick with which a bass drum is beaten. The instruments are not more than a mile apart, and all are placed in a direct line north and south. When standing outside the building in which one of them is kept it is difficult to hear the blow, though it is distinctly heard in the building a mile distant. The instruments are *en rapport* with one another, and when struck the neighboring ones to the north and south respond to or echo the blow. An Indian at the instrument which thus responds answers the signal, and then the operators are able by a system of signalling to carry on a long conversation.

THE FREE ZONE.—The Free Zone is a narrow strip of territory extending along the northern border of Mexico from the Gulf of Mexico to the Pacific Ocean, and about $12\frac{1}{2}$ miles wide. It was established by Mexico many years ago as a concession to the States bordering the Rio Grande, and a protection against smuggling from the United States. There are a number of cities in the Zone, including Matamoros, Laredo and Nogales, but the total population does not exceed 100,000. Recent Mexican official reports say there are no industries of importance in the Free Zone, which is explained by the fact that manufactures produced there are required to pay the regular duty charges if taken into other parts of Mexico, and the tariff of this country practically keeps them out of the United States. Thus manufacturing industries have to depend upon the limited home consumption. All merchandise imported into the Zone for consumption there pays only ten per cent. of the regular tariff charges, but if shipped out of the Zone into the interior of Mexico, has to pay the additional 90 per cent. of the duties. The Secretary of the Treasury, Señor Limantour, in his report, says: "Many distinguished financiers and eminent statesmen are opposed to the Free Zone, but all recognize the fact that, on account of existing circumstances on the northern frontier, its sparse population, and its lack of resources in agriculture, industry or mining, the privilege could not be abolished without compensation, and the

problem lies in choosing some other advantage without prejudice to the rest of the country. The attitude of merchants in the interior is in general hostile to the Free Zone, because they consider it a privilege granted to only a certain portion of the country; but merchants who are far from the frontier do not consider it injurious. Mexican merchants who are near the Free Zone do not fear its competition, but complain of it because they cannot distribute their goods there without documents and fiscal inspection, as in the rest of the country."

THE MARYLAND GEOLOGICAL SURVEY.—The Baltimore *Sun* says that the Maryland Geological Survey, in coöperation with the United States Department of Agriculture and State Experiment Station, has been making a special study of the distribution of soil types while the geological survey has been in progress. Mr. C. W. Dorsey has been in charge of this phase of the work. The connection between the soils and the indigenous plant life is readily apparent, and the Survey is paying some attention to the distribution of the flora of the State.

WEST INDIAN WEATHER SERVICE.—On July 7th last, Congress authorized the Chief of the Weather Bureau, with the consent of the various foreign Governments concerned, to establish and equip meteorological observation stations at such points in the West Indies and on the coast of the mainland bordering the Caribbean Sea as might be desired. The purpose of this extension of the weather service is to collect and disseminate information of the approach of tropical hurricanes or other storms to the West Indies and our coasts, and to publish such further climatological data as may be of public benefit. Preparations were at once begun, permission to establish the stations was readily obtained from a number of the Governments, and observers were sent to establish the stations. These stations are now in operation at Willemstad (Curaçao), at Santiago (Cuba), at Kingston (Jamaica), at Port of Spain (Trinidad), at Santo Domingo (Santo Domingo), at St. Thomas, at Barranquilla (Colombia), at Bridgetown (Barbados), at St. Christopher (St. Kitts), and at Colon (Colombia). The central station is at Kingston, Jamaica, and all other stations of the system cable daily to Washington and Kingston reports of observations taken at 6 A.M. and 6 P.M., seventy-fifth meridian time. In the event of premonitions of approaching hurricanes special observations are telegraphed. This service was hastily organized to meet a demand on the part of naval and commercial interests for

warning of destructive storms in the Gulf, the Caribbean Sea and the West Indian Islands. Arrangements were made for the prompt transmittal of the information to our fleets in West Indian and Southern waters, and to West Indian and Southern coast ports in threatened districts. Prof. E. B. Garriott, who is in charge of the service, wrote to the *Monthly Weather Review*, under date of Aug. 3:

"The service is not organized for local climatic studies, but it is confidently expected that through the co-operation of representatives of European Governments having possessions in the West Indies, and of the countries bordering on the Caribbean Sea and the Gulf of Mexico on the south and west, a system of weather reporting stations can be permanently established, which will not only permit the forecasting of hurricanes and northers, but allow of such a determination of the climatic conditions as will be a most important factor in developing the wonderfully rich agricultural resources of the West Indian Islands."

ASIA.

EXTENSION OF BRITISH TERRITORY AT HONG KONG.—The accompanying map from the *Geographical Journal* (Sept., 1898), shows by a broken line the present limits of the territory of Hong Kong controlled by Great Britain. On June 9 the Chinese Government leased to Great Britain for ninety-nine years certain territories on the mainland, opposite Hong Kong, which were needed



to assure the proper protection of the colony and also to provide for commercial expansion. The island of Hong Kong has proved too small for the requirements of its immense and growing trade. The concession includes the whole of the peninsula opposite Hong Kong, as far as a line joining Deep Bay and Mirs Bay as well as the island of Lan-tao. The waters of both bays are included in the list, but

their northern shores are retained by China. The total area is about 200 square miles, all of which will be under British jurisdiction, except within the native city of Kau-lung. China reserves the right to use the leased waters for her own ships whether belligerent or neutral. Fifty years ago the place where Victoria now stands on the island of Hong Kong was a fishing village containing a few scores of squalid huts. On this site is now a splendid city of 250,000 inhabitants, and its prosperity has grown out of the fact that it has represented in the far East the greatest trading nation in the world. It made Great Britain a neighbour of China, Japan, and the islands of the Malayan waters, and, other things being equal, trading peoples are in the habit of dealing more largely with their neighbours than with others. Hong Kong is the great commercial clearing house in the far East. Manila, with its commanding position in relation to all of China's ports from Canton to the Yangtse, may some time rival Hong Kong in this respect.

AFRICA.

CIRCUMNAVIGATION OF LAKE BANGWELO.—Mr. Poulett Weatherley, in the summer of 1896, was the first explorer to circumnavigate Lake Bangweolo. His examination of the north-western and western sides constitutes new discoveries. He gained great influence over the natives, and his fearlessness seemed to deeply impress them. As he approached the west shore of the lake at Karoma's *boma* he saw the hills swarming with natives who carried bows, spears, axes and guns. His own weapons consisted merely of a bow and one arrow, but he did not hesitate to jump ashore among the densely packed crowd. Upon an order from their chief the natives paid homage to the white visitor by dropping on their knees and bending their heads to the ground, and the explorer had no trouble with them. In the account of his work printed in the *Geographical Journal* (Sept., 1898), Mr. Weatherley writes that he made no sounding in the lake over fifteen feet. The lake surface, therefore, is usually still, a very strong wind raising only the smallest sea. The lake was formed by the water from the great watershed of the Tanganyika plateau, which gradually overflowed the country at its base. On the east and south-east there is no barrier to check the waters, and in those directions a large swamp from twenty to forty miles in breadth extends beyond the proper limits of the lake. Ranges of hills hem in the lake on its west and south-west coast. Along the north-west coast is an isthmus extending into the lake and connecting points on the mainland about thirty miles apart. The area

enclosed between the isthmus and the mainland is occupied by a large sheet of water called Chifumauli. Bangweolo, the name which Livingstone gave to the lake, is not known in the country. Mr. Alfred Sharpe suggests that the word may have come from Pa-mwelo, which means "at the lake." Mr. Sharpe says that in this part of Africa there is no special name for any lake, the word "Tanganyika" does not really mean any particular lake, but simply a large piece of water. It is the same with the words "Nyassa," "Nyanza," and other words used to designate water surfaces.

Mr. Weatherley draws an idyllic picture of the peace and happiness of some of the densely populated islands. Speaking of Kisi Island, he says nearly all the people in the evening he spent with them were employed in one way or another. They were making and mending mats, beating the bark of the *mitai* tree into cloth, carving pipe bowls, mending bows, smoking or chatting. Women were trooping in from the fields carrying pumpkins, cassava, bundles of firewood or calabashes of water from the lake, balancing all loads on their heads. The sheep and goats were being driven homeward to be penned for the night. War never comes near these happy islanders. They know nothing of the outside world, have all they need and seem to wish for nothing. The explorer expresses the hope that it will be centuries before civilization with its attendant evils robs Kisi Island of its present peace and contentment.

EXTENDING THE TELEGRAPH ACROSS THE CONGO STATE.—The telegraph line from Boma on the lower Congo to Stanley Pool, a distance of about 300 miles, has been completed. The line is now building between the Pool and Kwa Mouth on the upper Congo. The Government has decided to extend this line clear across its territory from the Atlantic to Lake Tanganyika, and an expedition left Brussels late in August, according to *Le Mouvement Géographique*, to go to Tanganyika by the Nyassa route and begin building the line from the east end. Ten Europeans were in the party, including Mr. Thornton, who has had much experience in telegraph construction in India, Australia, and South Africa. The line, in its central part, will follow the great bend of the Congo.

A STEAMBOAT ON LAKE CHAD.—The Paris newspapers announce the arrival on November 1st last of the steamer *Léon Blot* on the waters of Lake Chad. M. Gentil has, therefore, succeeded in the enterprise which he was sent out three years ago to accomplish, of placing a steamer on the Shari River and Lake Chad. His steamer was taken up one of the northern tributaries of the Mobangi, afflu-

ent of the Congo, and transported by natives across the water parting between the Congo and Shari basins, where it was launched upon the tributary of the Shari River, and then made a successful descent of that river to the large lake on the edge of the Sahara. Near the mouth of the Shari, M. Gentil writes, the lake presented the appearance of a veritable sea, but right at the mouth a number of islands blocked the entrance of the river and nothing is to be seen but grass, reeds and papyrus. No firewood could be obtained on the shores of the lake, though there is an abundance of it on the banks of the lower Shari. On account of the scarcity of supplies M. Gentil was not able to make a complete exploration of the lake, but returned to Baghirimi and the Gribingi, where he wrote the letter announcing the launching of the first steamer on Lake Chad.

OCEANIC RESEARCHES.

ADMIRALTY SURVEYS IN 1897.—Last year, eight British naval vessels with three small hired steamers, manned by seventy-five officers and 756 men, were employed on hydrographic surveys on the home and foreign stations. The number of newly discovered rocks reported shows no signs of diminishing. Records of no less than 190 rocks and shoals, dangerous to navigation, were received by the Hydrographic Office and due notice was issued to mariners. One of the surveying vessels made a long cruise to Honolulu, via Palmyra and Fanning Islands, to search for reported shoals, survey islands and obtain soundings that would be useful for the proposed Pacific cable. From Fiji a line of soundings was run through the Nanuku passage to the reported positions of the various banks lying near the parallel of 12° S. and extending over several degrees of longitude. The Lalla Rookh, Robbie, Adolph, Turpin and an unnamed shoal were found as well as two other banks, which received the names of Home and Tuscarora. These banks rise from a general depth of 2,500 fathoms and are of the usual coral formation. They vary between three and twenty miles across, and the larger ones show the submerged atoll form. The smaller are flat, with from nine to twenty fathoms of water over them. The general depth of the larger banks is from twenty-five to twenty-seven fathoms. No danger was found on any of them.

THE GREAT WIND AND CALM BELTS.—Mr. R. DeC. Ward, writing in the *Journal of School Geography* (Sept., 1898) of his climatic observations during his recent voyage around South America, speaks of the fact, to which teachers should call the attention of their pupils, that text books and wind charts are apt to give a too rigid idea of

the wind and calm belts and also the limits of the ocean currents. The fact is that travellers rarely pass suddenly from one condition to another, there being no distinct line of demarcation, but rather a gradual change. Mr. Ward illustrates this by the gradual transition he observed between the north-east trade wind and the doldrums, in latitude $10^{\circ} 2' N.$ lat., $44^{\circ} 2' W.$ long. He was there in the middle of June and at that season, when the sun is north of the equator, the north-east trade does not in the part of the Atlantic above indicated extend nearer the equator than about lat. $7^{\circ} N.$ lat., the equatorial rainy belt being at this time as far north as this. There were three days of characteristic trade conditions and then came a gradual decrease in wind velocity and an increase in the number and duration of showers, both of which indicated approaching doldrum conditions. On June 15, there was a mixture of trade and doldrum conditions, but the steady, easterly wind all day was a continuance of the trade influence. This combination of the two types where the two wind belts joined was most interesting and the interest was continued throughout the following day (lat. $6^{\circ} 33' N.$, long. $42^{\circ} 39' W.$) which brought the return of trade conditions interrupted by one heavy tropical shower, at 10 A.M. The water temperature of this day reached 83.5° , the highest noted on the voyage, and the air temperature reached 84.9° . Mr. Ward continues:

"The writer read somewhere, years ago, in an account of the doldrum rains, that the amount of fresh water which falls in one of these heavy showers is so great that the surface water of the ocean actually becomes fresh, and he had often, in the course of his teaching used this as an illustration of the remarkably heavy rainfall of those latitudes. The atmosphere of incredulity which pervaded the class-room whenever this story was told caused him to resolve to test the truth of the report at the earliest opportunity. This opportunity came on June 15. After a very heavy shower of half an hour's duration, some of the surface water of the ocean was drawn up in a bucket and on being tested was found to be almost perfectly fresh. The writer can, therefore, assure teachers that they may use this illustration with perfect confidence."

GERMAN DEEP SEA EXPEDITION.—The *Valdivia* left Hamburg Aug. 1 on its scientific mission around the world. The expedition which was planned by Prof. Chun was organized to make zoological, physical, and chemical researches. Last winter the German Parliament voted 300,000 marks to cover the expenses of the expedition and further grants will be made if necessary for the same purpose

and to publish the results. The *Valdivia* was fitted up with bacteriological, chemical and biological laboratories, as well as with instruments for sounding, taking temperatures and samples of deep sea waters, and for dredging and working the plankton nets at various depths. The vessel is as large if not larger than the *Challenger* and the laboratories and work-rooms are more commodious and better fitted with apparatus for scientific investigation than in any previous expedition. The cabins occupied by the scientific staff are handsome and roomy and the large cabin contains a very fine scientific library, including a complete set of the *Challenger* reports. The scientific staff includes Prof. Carl Chun, leader, Dr. Schott, oceanographer, well known for his recent researches on sailing vessels running between Germany and the East Indies, and also a botanist, a chemist, a physician and bacteriologist and three zoologists. The *Valdivia* rounded the north of Scotland and proceeded for Cape Town, Africa, it being estimated that she will be 100 days in reaching that point. After leaving Cape Town, the plan includes an examination of the Agulhas bank and the deep waters to the south; then southward to the edge of the Antarctic ice, returning northward to the centre of the Indian Ocean to Cocos and Christmas Island and to Padang. From Padang, the route leads to Ceylon, Chagos, Seychelles and Amirante Islands, to Zanzibar. Then home by Socotra, the Red Sea and the Mediterranean, Hamburg being reached early in June next year.

OCEAN TEMPERATURES.—Sir John Murray, the editor of the "Results of the Challenger Expedition," has an important paper in the *Geographical Journal* (Aug., 1898) on the Annual range of Temperature in the Surface Waters of the Ocean. His chart takes account not of the mean monthly temperatures, but of the so-called absolute annual range or the difference between the absolute extremes of temperature. From his paper and chart it appears that the lowest recorded temperature reading, at the surface of the sea, is 26° Fahr. in the north Atlantic, east of Nova Scotia, and the highest reading in the open ocean is 90° Fahr., recorded in the tropical Pacific, both north and south of the Equator, though readings of 94° and 96° Fahr. are recorded in the Red Sea and Persian Gulf, respectively. The greatest known range of temperature of surface waters throughout the whole world is thus 70° Fahr. The greatest annual range, exceeding 50° Fahr., occurs over a small portion of the Japan Sea and over the larger portion of the Atlantic Ocean, east of Cape Cod.

The large annual ranges of temperature of the ocean surface, viz., 25° or more in the north Atlantic and north Pacific, undoubtedly represent the influence of the cold north-west winds blowing off shore in winter, as contrasted with the warm, southerly winds blowing on or along shore in summer. The regions of large range are, therefore, confined to the western portions of the oceans and the eastern shores of the continents. The *Monthly Weather Review*, commenting on Dr. Murray's paper, says:

"At first thought one would expect to find in Dr. Murray's lines of equal annual temperature range some traces of the course of the Gulf Stream and Kuroshiwo, but it is only the changes in the positions of these currents that can produce ranges of temperature, and these changes are so largely controlled by the wind that Dr. Murray's charts show principally the effect upon the ocean water of changes in the atmospheric circulation. The same principle applies also to the closed seas, such as the Mediterranean and Baltic, the Red Sea and the Persian Gulf, in all which cases a larger range of temperature is observed at the head of the sea than at the mouth of the sea, due to the fact that the highest temperatures occur at the head when the wind blows towards that direction in the summer and the lowest when the wind blows in the opposite direction, at the opposite season of the year. There is, therefore, in this map no comfort for those who maintain that the Gulf Stream or the Kuroshiwo, respectively, alleviate or control the temperatures of the eastern portion of the Atlantic and Pacific oceans and the adjacent portions of Europe and America. Everywhere we see that it is the wind that controls the temperature of the surface of the ocean and then carries this ocean temperature inward over the land. The same remarks apply to the southern hemisphere, where Dr. Murray's chart shows that the greatest range of ocean temperatures is in the region where there is the greatest annual range of wind direction."

POLAR REGIONS.

SPITZBERGEN CIRCUMNAVIGATED.—The London *Times* (Sept. 22) says that the *Antarctic*, with the Swedish Expedition under Dr. A. G. Nathorst, has returned to Tromsö, after a highly successful cruise to the seas and islands around Spitzbergen. The *Antarctic* left Tromsö on June 8 and reached Bear Island on the 11th. A week was spent there. The whole island was surveyed, and an excellent map on a scale of 1:50,000 was drawn by Lieut. Kjellstrov and Dr. Hamberg, which shows that the old maps are quite incorrect. The

geological work was also successful. Previously only carboniferous strata were known, and an old rock without fossils. In this rock, however, the expedition found fossils, showing the age to be Silurian. Another series was also discovered, the age of which is probably Devonian. The geologists discovered fossils in the "Three Crowns," forming the top of Mount Misery, which will probably prove to be of Jurassic age. The geology of the little island is consequently of great interest. Some new zoological and botanical discoveries were made. The *Antarctic* went east of Spitzbergen to ascertain the position of the ice-pack, but, as was expected, the ice did not permit of the expedition reaching King Charles Land. They consequently sailed round the west of Spitzbergen, when Bell Sound was surveyed and mapped, a most necessary work, since the old maps of Van Myen Bay (Bell Sound) are very incomplete.

After having visited some points of interest in Ice Sound, the expedition proceeded westwards and did some hydrographical work as far as the margin of the Greenland ice-pack ($78^{\circ} 1' \text{ N. lat.}, 4^{\circ} 9' \text{ W. long.}$). Thence the ship was turned to the south and east of Spitzbergen, and reached King Charles Land, which was completely covered by an ice-cap, broken off at the sea shore and ending in a perpendicular ice wall, just as is found in the Antarctic Continent, though in miniature. Great table-formed icebergs are given off from this ice-sheet.

From White Island, which is larger than indicated on the maps, the *Antarctic* made its way through alternating heavy ice and open water to Charles XII. Island, whence the expedition proceeded northwards and reached $81^{\circ} 14' \text{ N. lat.}$ Had the expedition been there a fortnight earlier it would certainly have reached a higher latitude, but northerly winds had prevailed for some time, so that the pack had been driven south. The expedition then passed north of the Seven Islands and proceeded to Treuenberg Bay, Grey Hook, and Danes Island, from which they steered southwards along the western coast of Spitzbergen. When the *Antarctic* reached the south end of Prince Charles Foreland, the circumnavigation of the whole of Spitzbergen, with the surrounding islands, was completed. Probably no vessel has ever done this before. Dr. Nathorst's intention to go to Stor Fiord was rendered impossible through heavy gales, and, having waited in vain for about a week for the weather to improve, he steered southwards, passing Bear Island again and doing hydrographical work. The scientific work of the expedition has been most successful. The party have brought back large geological, botanical and zoological collections. The geology,

botany and zoology of King Charles Land are now completely known, and there are evident important connections between the geology of Spitzbergen and that of Franz Josef Land.

THE GLACIERS OF SPITZBERGEN.—Sir Martin Conway has described his work in 1897 among the Spitzbergen glaciers, in the *Geographical Journal* (Aug., 1898). He regards as the principal geographical result of his second expedition to this island group the discovery that no large part of Spitzbergen, except New Friesland and North East Land, is covered by an ice-sheet. The old idea of Spitzbergen was that its interior consisted of a great ice-sheet fringed at the edge by a number of boggy valleys and green hillsides. His explorations have shown the falsity of this conception, as the larger part of the region consists of glacial and mountain areas, to which the term inland ice does not apply, as the juxtaposition of any number of glaciers does not form an ice-sheet, but merely a glacial area.

SPITZBERGEN WITHOUT AN OWNER.—No nation has ever yet claimed Spitzbergen as its own, though the people of Sweden and Norway seem to regard it as a part of their kingdom, because it lies nearest to their coasts and has been explored chiefly by them. The *Geographische Zeitschrift* says the Russians have recently put forward some claim to the group in consequence of the invitation of the Swedish Government to join in the measurement of an arc on Spitzbergen. The group has an area of 27,000 square miles and though uninhabited it is by no means valueless, the region being rich in minerals, such as coal, iron, marble and graphite. There are indications also of the existence of gold. The seal and other fisheries have been and still are of great importance and demand State regulation to prevent their total extinction.

MR. WELLMAN'S EXPEDITION.—Mr. Wellman left Tromsø on June 27 for Franz Josef Land. His party includes Prof. J. H. Gore of Columbia University, Mr. Evelyn B. Baldwin, Dr. Hofma, and Mr. Quirof Harlan of the United States Coast and Geodetic Survey. It is Mr. Wellman's intention to advance northward from Cape Flora and, if possible, beyond the place where Nansen wintered, where he will build a hut and spend the dark season. Next spring he hopes to go on towards the North Pole, but if conditions are not favorable he will wait till the following spring. It is gratifying to hear that the meteorological observations of Mr. B. O. French of the Coast and Geodetic Survey and Dr. H. Alme of the Meteoro-

logical Office at Stockholm, north of Spitzbergen on the first Wellman expedition, are to be printed as a bulletin of the Weather Bureau. Competent observations at points so isolated and so far removed from the regular meteorological stations should be printed in all detail, as they may be of much value in tracing storms and weather over the North Atlantic.

PROPOSED EXPEDITION TO SANNIKOFF LAND.—Baron E. von Toll has outlined the plans of an expedition which he desires to lead to Sannikoff Land, north of the New Siberia Islands, next year. Between 1805 and 1811, Jacob Sannikoff, a Yakutsk merchant, made a series of bold journeys to the New Siberia Islands, of which he was one of the discoverers. He spent a full summer on the northern island of the archipelago and sighted two lands to the north, which were indicated on the map of the islands that was produced by the topographer Pshenitsyn. A few years later Lieut. Anjou, who was sent out by the Russian Government to settle more definitely the topography of the archipelago, was not able to get a view of the lands sighted by Sannikoff, who had made two unsuccessful attempts to reach them by sledging over the sea ice. After Anjou's last sledge journey along the northern coasts of New Siberia, he returned in 1823 and reported that there was no land to the north of the archipelago which could be attained with the means at hand. So the "Land sighted by Sannikoff" disappeared from the maps until about sixty years later, in 1881, when the De Long expedition discovered Bennett Land, which is undoubtedly the land that Sannikoff sighted from the High Cape of New Siberia. In 1886 Baron von Toll was able to convince himself of the existence of the land that Sannikoff saw to the north of Kotelnai Island. Baron von Toll saw from the mouth of the Mogur River the sharp outlines of four truncated cones, like table mountains, from which a low foreland extended towards the east.

In his paper he discusses the geological bases for believing that Sannikoff Land belongs to an undiscovered archipelago, which may possibly have the size of Franz Josef Land but hardly the size of Spitzbergen or Greenland. He desires to explore this archipelago and to study it in its various scientific aspects, with the collaboration of an astronomer, a meteorologist and a topographer, and a few Yakuts or Tunguses to act as hunters and dog drivers.

ANTARCTIC EXPLORATION.—Lord Salisbury, in reply to a letter sent to him by the Royal Geographical Society, urging upon the Government the duty of England to complete the work of explora-

tion in the Antarctic regions, begun by Ross half a century ago, has finally replied that he is not able to hold out any hope of the British Government "embarking upon an undertaking of this magnitude." It has also been ascertained that there is no prospect of any joint action from the Australian colonies. The Council of the Society, feeling that it is the duty of Great Britain to explore the vast region still unknown in the Antarctic, has authorized the President to take steps to obtain the necessary funds, not less than \$250,000, towards which the Society would contribute \$25,000.

Mr. Borchgrevink departed early in the summer for the scene of his proposed explorations in the neighborhood of Victoria Land, in the Antarctic, where he expects to be engaged for two years. The funds for his expedition were provided by Sir George Newnes. His Ship is the *Southern Cross*, which has already sailed in Antarctic waters. Captain Bernherd Jensen is in command, with two mates and a crew of twenty-four. A strong scientific staff was engaged, including Captain Kolbeck and Mr. Louis Bernacchi, as magnetic observers; Herr H. Klövstad, of Christiania University, as medical officer, and Messrs. N. Hansen and Hugh Evans, as zoologists.

WASHINGTON LETTER.

WASHINGTON, D. C., OCTOBER 12, 1898.

SURVEYS IN ALASKA.—Several of the parties of topographers and geologists who were in Alaska during the summer have returned to the United States, reaching Seattle early in October, and the remainder are expected to follow shortly. Mr. Edwin C. Barnard's party of 16 men, reaching Lake Bennett in April, spent nearly a month waiting for the ice to break. They finally arrived at the mouth of White River in June, leaving Mr. William J. Peters, topographer, and Mr. Alfred H. Brooks, geologist, who with 4 men turned up White River, mapping the country and making a geologic reconnaissance. This party found a low pass occupied by a wide marsh and leading to the headwaters of the Tanana. The three canoes were transported over this marsh and the trip down the Tanana was begun the latter part of July. Triangulation was carried along the banks of this river and the topography sketched until the prevailing smoke prevented further work of this character. Beyond this point stadia measurements were continued nearly to the Yukon. It was arranged to reach this latter point on the first of September, and it was found necessary to drop the stadia measurements and make a hasty circuit in order to reach the Yukon on the date set. A short time after reaching the mouth of the Tanana the party boarded one of the Yukon River steamers and arrived at St. Michael early in September. In the meantime, Mr. Barnard's party proceeded down the Yukon from the mouth of White River, and crossing the international boundary into Alaska, mapped a quadrangle, covering one degree of latitude and longitude. When this work was completed, Mr. Barnard proceeded down the river and reached St. Michael just in time to leave for Seattle with the first party.

Mr. Eldredge proceeded to Cook Inlet and up the Sushitna River with the intention of crossing a path to the Tanana, but owing to various unforeseen contingencies did not succeed in doing this. After making a thorough examination of the country and obtaining results of value, he returned southerly and took passage from Toyonak on Cook Inlet by the first available steamer, reaching Seattle on October 8. Mr. Spurr, who had left Mr. Eldredge's party with the

intention of going westerly down the Kuskokwim River, succeeded in carrying out his plan, and reaching tide-water, sent three men across the portage to Yukon River and to St. Michael. He, with two others, took a sailing boat with the intention of coming southerly into Kuskokwim Bay and easterly to Bristol Bay and Iliamna Lake, with the object of reaching some port on Cook Inlet.

EXPLORATIONS IN THE SOUTHWEST.—Dr. J. Walter Fewkes, of the Bureau of American Ethnology, a branch of the Smithsonian Institution, has left to continue his studies of the Pueblo Indians of northeastern Arizona. In preceding years he has acquired a familiarity with the languages and customs, such that he has been admitted to various secret or semi-religious organizations among the Indians. By a careful study of their traditions he has been able to trace out the migrations of the Mokis and has identified the ruins of ancient towns. From these he has obtained a large and valuable collection of ancient pottery, implements, and other articles, which during the past year have been arranged and placed upon exhibition in the National Museum. In connection with this he has also prepared a series of papers which are being printed in the annual reports of the Bureau of Ethnology. The work now under way is intended to extend the knowledge already gained, particularly of the ceremonials which, while now practised, are being rapidly modified or outgrown.

INTEROCEANIC CANALS.—The Nicaragua Canal Commission, of which Admiral Walker is president, has returned to Washington and established offices in the city, where presumably the official report will be prepared for early presentation to Congress. Nearly all of the engineers and employes have been brought in from the field with the exception of two parties, one under the charge of Mr. Arthur P. Davis, continuing the study of the hydrography of the route traversed by the canal, and the other under Dr. C. Willard Hayes, making borings for sites for dams and studying the rock structure. The data being brought together and digested by these specialists are of a character that has been almost neglected in previous surveys, and yet are of such fundamental importance that all estimates must of necessity rest upon them. In the earlier reports various assumptions have been made as to the probable water supply and the possible character of the rock and earth, but from lack of precise data the points have been lightly touched upon, although involving the whole question of feasibility. It has, therefore, been the desire of the present Commission to give particular

attention to these points in order that these great sources of uncertainty may be removed.

While the Nicaragua project has been attracting public attention the Panama scheme has been quietly investigated, and it is probable that about the time the report of Admiral Walker appears there will be an exhaustive discussion of the merits of the canal at Panama. The new Panama Canal Company, organized in October, 1894, has employed a technical commission consisting of French, English, German, Russian, and American engineers. These have made a thorough examination of the present condition of the Panama Canal and have prepared many elaborate alternative plans and estimates sufficient for the determination of the questions as to the method and cost of final completion. It is stated that about 40 per cent. of the whole length of the canal has been actually excavated. Many advantages are claimed for the Panama route over the Nicaragua, particularly in the fact that good ports already exist at each terminal of the former, while in the case of the latter they must be artificially prepared.

STATISTICAL ATLAS.—The Statistical Atlas of the United States, prepared by Henry Gannett, and based upon the results of the eleventh census, has been issued and is now being distributed. Work upon it was completed in June, 1896, but the preparation of elaborately colored maps and diagrams and various difficulties have operated to delay the final publication. These illustrations are accompanied by sufficient explanatory text to make the meaning clear, but it is surprising to note what a wide range of information is conveyed in an easily comprehensible form by graphic methods. The development of the country and the increase in population as a whole and by States is shown by a series of maps, and the original nationality, the migration of the people, their health, religion, occupation, and wealth, brought out by various color schemes. One of the most striking items is the distribution of the foreign-born population of the United States with reference to the countries from which these people came. Natives of the Germanic nations are shown by the maps to have concentrated around the western shores of Lake Michigan and in the country northwest of this, while the Scandinavians have gone still farther to the northwest into Minnesota and the eastern part of the Dakotas. The natives of Ireland, on the contrary, are found for the most part consolidated along the Atlantic Coast, in the southern New England States and New York, so much so that in Massa-

chusetts, Rhode Island, and Connecticut the persons born in Ireland constitute nearly one-half of the foreign-born population. The inter-State migration is illustrated by a series of small maps which show by appropriate colors the other States, into which the natives of a particular State have gone. For example, beginning with Alabama, a glance at the map shows that most of the natives of Alabama, who have left that region, have gone to Mississippi and to a less extent to the adjacent States as far west as Texas, comparatively few going north. On the other hand, the natives of Connecticut have spread out westerly into Ohio and Illinois, and through the northern half of the United States to the Pacific Coast. The trend along parallels of latitude or lines of similar conditions of temperature is fairly well marked. The yield of various farm crops is elaborately discussed by maps, and following this the condition of manufacturing, as well as the wealth and indebtedness of the country. If fact, nearly every matter of importance to the country as a whole has been illustrated in its most striking form. Even a casual inspection of these maps and diagrams reveals many facts of interest or surprise, and a thorough study of them enriches the mind.

WESTERN NEBRASKA.—A copiously illustrated report upon the topography and geology of western Nebraska has been prepared by Mr. N. H. Darton, and is being printed in Part IV. of the Eighteenth Annual Report of the United States Geological Survey. This area being traversed by but few railroads has been little known. In many respects it is similar to western Kansas, but, as it lies well within the semi-arid or even the arid region of the country, it has not passed through the cycles of "booms" and depressions which have characterized its more southern neighbor. Settlement has progressed slowly, and, with the exception of the cattle ranches, has been confined mainly to the valleys of the North Platte, Niobrara, and White Rivers.

One of the most striking features of this country is the great area of sand hills. These have been considered almost, if not quite, worthless except for grazing purposes. The sand is in small hills, irregularly grouped, and rising to a height of 50 to 100 feet, or even more. The area capped by them is estimated at 24,000 square miles, or three times the extent of the State of Massachusetts. The hills and ridges are irregularly scattered over the surface, often so closely grouped as to encroach upon each other. For the most part they are moving slowly toward the southeast as the sand is blown forward by the prevailing winds. The surface is

usually covered with a somewhat scanty herbage, retarding the drifting of the sand. Many of the grasses furnish excellent forage, and large herds of cattle find sustenance in this part of the State. On some of the higher or more exposed hills the winds have been able to break through the covering of vegetation and, getting at the soft sand, to dig this out, forming what are locally known as "blow-outs." These blow-outs rapidly eat their way forward, the sand being transferred from the steep face up over the top of the ridge and deposited in gentle slopes to the leeward.

The rain falling upon the sand-hill area sinks in immediately and cannot establish drainage lines. Penetrating downward and laterally it saturates the lower layers of the sand where these rest upon comparatively impervious clays. The water plain thus formed occasionally rises so high as to result in small ponds or pools in the deeper valleys among the hills. In many places water can be obtained by merely scooping out the sands of the lowlands. Although the soil is so light, yet recent experience has shown that crops can be raised. By applying some of the water which can be pumped from beneath the surface, gardens or small farms have proved remunerative. Thus the sand-hill region, once classed as desert, has been found to possess many resources which can be turned to advantage.

THE BAD LANDS.—During the past summer the examination and study of the Bad Lands east of the Black Hills has been carried on. In spite of their name the Bad Lands of South Dakota are among the most attractive of the scenic features of the West. They have been little known and rarely visited except by collectors for museums—or "bone hunters," as they are commonly known. These lands owe their origin to the existence of thick deposits of sand and clay, of comparatively recent origin geologically, and having a relative hardness such that they are eroded with extraordinary rapidity by the occasional showers of the arid region. Beds of similar character and age, if situated in a humid area, would have been washed away centuries ago, but in a dry country, where the drought is broken only by downpours at long intervals, these beds have been cut into the most fanciful forms. They lie almost horizontal and on top present the aspect of grass-covered flats, being portions originally of an extensive prairie. In driving along on top of these remnants a person has the impression that he is upon a great plain stretching to the horizon. Suddenly, however, and almost without warning, he reaches the edge of a great cañon opening at his feet to a depth of several hundred feet, and with walls most beautifully

sculptured with buttresses and pinnacles. At the bottom is a nearly level valley, beginning abruptly at the foot of the cliff and without the usual talus slope. This latter feature is one of the most surprising in the erosion of the country. The soft sands and clays when broken down are apparently carried off immediately and the lower plain—that of the valley—is continued to the very bottom of the cliff, which rises to the ancient and disappearing plain. Between the two are the almost vertical walls, which can be climbed in only a few places. Across the Bad Lands trails and roads have been made by the Indians, so that following these a person may drive or ride a bicycle, the path extending either along the valleys or on the upper plain. If on the latter, he may pass through the Bad Lands almost without seeing their wonders, as his eye rests mainly upon remnants of the old surface. In attempting, however, to go across out of the beaten tracks, progress is soon found to be blocked by the abrupt cliffs and, should the traveler succeed in climbing in and out of one of these cañons, he would usually find others blocking his progress in the most bewildering fashion, so that he may travel across or around the head of these for hours and make little onward distance.

In the walls exposed by erosion are to be found the remains of gigantic land animals and of turtles. The latter are to be seen almost everywhere, some of great size, two feet or even more in diameter. Occasionally a turtle shell is found capping a low pillar formed by the harder shell protecting the soft rock under it from erosion. The great massive bones and teeth of the *titanotherium* are common, and in the higher beds those of the small and apparently graceful *oreodon*, one of the predecessors of the modern horse. The teeth and other parts of carnivorous animals are also found and the great variety of well-preserved bones has attracted the attention of collectors for museums, so that through the labors of Marsh, Owen, and Cope, the region has been known as a rich field for the palæontologist, rather than for the attractions which appeal to the ordinary tourist or traveller. Access to the region is comparatively easy from the railroad stations to the east of the Black Hills, and the roads are for the most part excellent. The superb climate and wonderful views must in the future attract the seeker for the novel or the beautiful, especially when the results of the surveys now being conducted are available for general use.

SOUTHERN UTE RESERVATION.—In the Act making appropriation for the expenses of the Indian Department, approved on July 1, 1898, it is provided that the Secretary of the Interior shall make an

investigation as to the practicability of providing a water supply for irrigation purposes on a portion of the Reservation of the Southern Utes. This tract of country lies in the extreme southwestern corner of the State of Colorado, draining into Mancos River, which in turn flows into the San Juan River, a tributary of the Colorado River of the West. An expenditure of upwards of \$150,000 was authorized for the purchase of water, if it can be had from some company already in existence. The carrying out of the terms of this Act will mark a notable advance not only in the development of the resources of the West, but in the settlement and partial civilization of some of the Indians regarded as least amenable to the customs of white men.

The occupants of the Reservation are known collectively as "Southern Utes" as distinguished from the Uncompahgre Utes and others of northern Utah. They consist of remnants of tribes known as the Kapoti, Muachi, and Wiminuchi Utes. In numbers they aggregate about 1,100, of whom about 400 nominally have permanent homes or allotments upon which they are supposed to live. The remainder have homes temporary in character and spend much of their time wandering over the Reservation, or on the neighboring mountains and desert plains. The total area of the Reservation is over one million acres, some of the land being of high fertility and capable of producing large crops if water can be had for irrigation.

Much of the Reservation, however, lies within the great mesa land, deeply dissected by the Mancos River and its tributaries. In the edges of the cañons thus formed are the wonderful cliff houses, and scattered through the valleys and over the high tablelands are innumerable ruins of houses and towns of unknown antiquity. It is almost impossible in this part of the country to find an acre or even a square rod of ground upon which there is not some bit of ancient pottery, or fragment of dressed stone, or other indication of the former presence of a considerable population. The Indians now occupying the country are totally ignorant of their predecessors, although recognizing the fact that people of a higher order of manual skill at one time inhabited these ruins. Fortunately the Utes, as well as the Navajoes and other tribes, have a respect, or more properly a superstitious dread, for the cliff houses, and, unless accompanied by white men, cannot be induced to approach them. It is related that an Indian guide, one who had been to school and could talk English, piloted a party of explorers to one of the largest ruins. While he was absent on some errand the white men discovered a mummy of one of the former residents of the town, and bringing it down from the cliff,

set it against the waggon. Upon returning, the Indian, coming unexpectedly upon the mummy, started back in fright, leapt on his pony and was last seen in a cloud of dust on the far horizon, never returning for his pay or personal belongings. This fear has operated to preserve these ruins for hundreds of years or until the advent of the cowboy and occasional tourist, the destruction wrought during the last decade being greater than that of many centuries.

It is obvious that the climate of this part of the country was probably no less arid in former times than at present, and that the people who built the houses now in ruins must have subsisted largely by agriculture, as there is no evidence that game was particularly abundant. The remains of corn and other cereals in the ancient villages show that these must have been cultivated, and there are not only traces of ancient irrigation ditches, but indications that some of the steeper hillsides were laboriously terraced and presumably highly cultivated. In other words, a large population lived in apparent comfort, where now a few Utes seem to be in danger of starvation. If these latter can be induced to practice some of the arts of their predecessors, there is every reason to believe that they will become self-supporting, thus relieving the Government from the necessity of doling out at regular intervals flour, bacon, and other provisions. To induce a people who have been pauperized by the issuing of rations to work and think for themselves is a difficult task, and one requiring that every possible facility be used. The small economies and careful conservation of moisture, which the ancient people evidently practised, do not at this time seem to be feasible, and therefore the Government has determined to provide an ample supply of water and to make the start of the Southern Utes on the road to civilization as easy as possible.

On the eastern end of what was formerly the reservation is a comparatively good supply of water from small streams flowing southerly from the La Plata Mountains. Here in the vicinity of Ignacio the Government has built a number of irrigating ditches and has, through the efficiency of the former Indian Agent, David F. Day, succeeded in inducing a number of Utes to cultivate their farms, the work being under the advice or supervision of an active farmer. The remaining members of the tribe have, however, refused again and again to take land in allotments and have held out against persuasion and inducements offered. They see no reason why they should work for themselves when the Government has

agreed to support them and their children, and in this they have been advised by the neighboring whites, for whose interest it has been not to permit the Indian to become a citizen and self-supporting individual. The efforts of the Government to better the condition of such tribes, not only against their natural inclinations, but also against the active opposition of the white neighbors, must be of the most vigorous character in order to make a decided change in the existing conditions.

The Southern Utes at the present time have little property beyond a few personal adornments and a small band of sheep. They own, unfortunately, a good many worthless horses, whose only use is to transport them from point to point, facilitating their restless wandering in the visits made by one family upon another, or upon distant tribes. If they did not have these it is probable that they would be more inclined to stay at home and to accumulate personal possessions, but, mounted on their ponies, a man with his wife and children will start off on a journey of several hundred miles to visit some distant relative or acquaintance, staying until the food supply of the person visited is exhausted, and then visiting in turn others, and finally coming back to the recognized family home, in which, however, but a few weeks of the year may be spent. Formerly the tribe, or small bands comprising the tribe, owned considerable numbers of cattle and sheep, but mismanagement on the part of the Indians and of various agents and authorities resulted in the loss of the cattle and most of the sheep, the horses alone being left.

The Indian customs are against the accumulation even of horses, for although these people, unlike many tribes, will not eat horse flesh, many horses are killed upon the death of some prominent chief or other individual. During this last summer one of the head men was very sick and his relatives began to kill his horses, fifteen being slaughtered before it was discovered that he showed signs of recovery. These horses were thus, even according to the Indian's belief, needlessly destroyed and did not enure to the chief's benefit in the next world even when he did die. Delicate questions of ethics have been brought up for the decision of the Indian agents on occasions such as these, as, for example, when sheep are killed on the death of a chief, as to whether the hides can be sold. The final conclusion, as reached by counsel called for the purpose, was that the sheep should not be skinned, as a man in the spirit world would be ashamed to be seen by his friends herding a lot of sheep without their wool. The Indian is thus hesitating between his ancient beliefs and the obvious necessity of adopting the white man's way

of looking at things. It is probable that if the surveys now being conducted upon and adjacent to the Reservation show that ample water can be had and the recommendations are carried out, one individual after another will probably try to raise a crop in the white man's fashion. But it is highly necessary that these first experiments should be successful, for failure at the start quickly discourages the Indian. When once the individual has broken away from his ideas of etiquette and hospitality, and has taken on the white man's covetousness and desire to own and possess personal property, it will be practicable to hold him to one spot of ground and put him in the way of becoming a citizen.

TWO ARID REGIONS.—At this time it is interesting to compare the arid regions of the Old World and their development with corresponding areas in the New, taking as an example Spain as a representative of the drier part of Europe and California as a corresponding example in our own country. The area of Spain in round numbers is 197,000 square miles, or about one-fourth larger than that of California, this being approximately 156,000 square miles. The population of Spain is about 17 million, while that of California, as shown by the census of 1890, is only a trifle over one and a fifth million, or about seven per cent. that of Spain, the density of population per square mile being respectively 90 and 8. The State of Ohio is in this respect comparable; it having an average of a little over 90 people for each square mile of its land surface.

If we should take the entire population of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York and New Jersey, and move all of these people into California, we would then have in that State an aggregate about equivalent in number to the total population of Spain. The point of comparison, however, is in the climate and the natural resources of the two areas. These have striking similarity, and if the old country can support such a great population it is to be inferred that with as fertile a soil, as favorable a climate, and as great mineral resources, the State of California may ultimately have not only a population numerically as great, but, due to better institutions, far higher intellectually. In both countries the rainfall of the greater part of the area ranges from 10 to 15 inches per year, in some portions amounting to 20 inches or even more. The more southern valleys have a semi-tropic climate favorable for the production of citrus fruits. The water supply is relatively small and sparsely distributed, and the rivers have less value for navigation than for use in

filling the irrigation canals and ditches of the farmers. Both countries, though depending largely for their agriculture upon a continuous water supply, have suffered severely from the lack of suitable laws governing the distribution and use of water, and future developments are being crippled by the uncertainty regarding this form of property.

A recent report of the Department of Agriculture exhibits the source of the wealth of Spain resulting from exportation. The total annual exports from 1881 to 1895 have averaged about 150 million dollars. Of this amount the principal item was for wines, averaging about 30 million dollars per year; next to this were mineral ores, 15 million dollars; and metals, mainly copper and lead, 17 million dollars. Fruits and nuts, both fresh and dry, aggregate 13 million; olive oil over 3 million; and cork, mainly in the form of stoppers and boards, over 4 million dollars. Nearly all of the agricultural products which have really formed the foundation for the development of Spain's population can be grown with equal success in California or portions of Arizona, New Mexico, and adjacent States. The natural resources are there awaiting the wise treatment which may render them available to the largest number of future citizens.

N.

MAP NOTICES.

BY

HENRY GANNETT.

The U. S. Geological Survey has issued five sheets recently. Two of these, known by the titles of Tolchester and Choptank, are in Maryland, and are upon a scale of 1:125,000, with contours having an interval of 20'. The first of these lies just east of Baltimore and includes considerable areas upon either side of Chesapeake Bay. The land west of the bay lies just above the fall line, and shows a country which has been base-levelled, elevated and subsequently dissected. The eastern shore of the bay is composed of the low, young country of the Atlantic plain, now in process of subsidence.

The Choptank sheet includes Annapolis in its northwest corner and a considerable area of the Atlantic plain upon the east side of the bay.

The first sheet from the survey of Indian Territory has appeared. This is known as the McAlester sheet, and is upon a scale of 1:125,000, with a contour interval of 50'. The town of McAlester is near its northern edge. It represents a region of narrow, rather crooked ridges, the general trend being northeast and southwest, being the westward continuation of the Ozark ridges. These ridges are mainly of sandstone, the valleys separating them being of limestone. It is a region quite similar in structure and in the effect of erosion to the Appalachian valley, having been greatly folded and faulted and subjected to erosion for a long period.

In Colorado is one sheet, Durango, in the southwestern portion of the State, upon the southern slopes of the San Juan Mountains. This sheet is on a scale of 1:62,500 with contours of 100'.

From Utah is one sheet known as the Tintic special sheet. It is upon a scale of 1:62,500, with a contour interval of 50'. It includes the Tintic mining district, with Tintic valley upon the west and Goshen valley upon the east. These are desert valleys without outlet, and the wash from the mountains has been deposited in them, filling them to great depths with detritus. Most of the streams flowing from the mountains have built up beautiful, although small, alluvial fans.

The U. S. General Land Office has published a map of Alaska, upon a scale of 48 miles to 1 inch, on which relief is expressed by crayon shading. The map is, in the main, a copy of that published by the Coast Survey with a little additional geographic information, such as the routes of travel, the location of missions, boundaries of land districts, mineral discoveries, etc. A rather premature attempt is made to show the isotherms of the region. The economy of preparing this map is questionable since it contains very little of a geographical character which is not shown upon the Coast Survey map, and nothing of an economic character which is not better shown upon that of the Geological Survey.

BOOK NOTICES.

Natural Advanced Geography. Jacques W. Redway and Russell Hinman, American Book Company, 1898.

The Natural Advanced Geography, supported as it is by two names so well known for their success as book makers, attracts an attention that is not usually given to school geographies. The book well deserves the attention it has received, for it contains much that is new and of interest, though it does not cut out a path for future text book writers. Though *man* is announced as the centre around which the book has been constructed, we cannot see that man is over emphasized or that he appears much more prominently than in most text books. There is still room for some future book that will emphasize the human relations to the earth, but in a strictly casual way, so that geography may still be as it should, geocentric. At present there is a tendency to make our geography work anthropocentric, as if we were primarily teaching anthropology or sociology, rather than geography.

The book as a whole is well arranged and pleasing in appearance, and readily usable. The uniform scale for maps is especially to be commended, as is also the careful placing of the illustrations so that they refer to the text, and furthermore to the text immediately adjacent. The illustrations are numerous and usually well chosen. The general appearance of the book is much marred, however, by the difference in quality of illustration in the first and last parts, and much would have been gained had a plate process been adopted for the pictures of our own country. As illustrations are to *illustrate the truth*, it is very unfortunate that so many ideal drawings on a bad scale should be adopted. Oxen that reach to a man's waist, and kangaroos as big as trees are hardly true to nature.

We find the usual lack of proportion in the amount of space devoted to the different parts of the globe so that the United States is emphasized until it may well seem as a recent critic has said "synonymous with the world." We also note the usual questions in the text that are answered in the next paragraph and the questions at the end of the chapters that any teacher who can use the book intelligently would never have need to employ. The suggestions for correlations and comparisons and for supplementary reading are on the whole very good and valuable, particularly when they emphasize the reasons for conditions. A well equipped teacher who

has a wealth of extra knowledge at her command for elaboration and illustration can use this book better than almost any other for making her pupils study the relations of cause and effect.

Some teachers will probably be surprised to find that the latest geography announces only *three* continents, and with reason, for it is an unusual usage. It should be said, however, that the authors have been consistent in this use throughout the book. The principles of the modern physiography have been adopted to a certain extent, and occasional summaries of land histories as given under the United States are excellent. We wonder, however, why the authors should adopt and use the word *peneplain*, which some scientists are still opposing, and should fail to use such simple, helpful and self-explanatory terms as *drowned* and *distributary*.

There are occasional statements of fact that we should question, but they are not numerous. The origin of dew as given on p. 14 is hardly adequate or complete, and the use of "Appalachian ridge or valley belt" to include the crystalline mountains to the east is an unfortunate extension of the term not warranted by the geographical history. The same may be said of the use of Prairie plains to include the Prairies and Great Plains. Furthermore, the description of the Great Plains as a part of the Rocky Mountain Highland, though necessary after the adoption of 2,000 feet as the upward limit of a lowland, includes two very dissimilar parts and separates the Great Plains from the eastward Prairies that have been formed under the same conditions and at the same time.

These are some of the questions of difference of opinion with which, perhaps, one should not quibble. When a book has so much to commend, however, it is natural to wish that the authors had gone a little farther, if for no other reason than to preclude the possibility of some new book to bring out a few new points and to add one more to the large list of available school geographies. In conclusion, we would say that any school not now using one of the two or three best books on the market, would find this book perhaps the best for introduction. It will be particularly successful in those schools where the teachers are not able to bring in much of the so-called "new geography." We should not advise other schools to exchange "an old lamp for a new"—for the book in question is not sufficiently in advance of its best competitors to warrant such exchange. The series of two books, the Elementary and Advanced, forms a logical and progressive combination, with less of a break between the books than in any other series we know.

R. E. D.

The longest paper in the *Revista* of the Museo de La Plata, Tomo VIII, is by the Director of the Museum, F. P. Moreno, on a topographical and geological examination (in 1895-96) of the Territories of Neuquen, Rio Negro, Chubut and Santa Cruz, all in the Andine region of Argentina.

The surveys extended over an area of 7,155 sq. kilometres, between the parallels of 36° and $46^{\circ} 30'$ S., and west of $70^{\circ} 30'$ West Longitude. There were 3 determinations of longitude, 328 of latitude and 201 of azimuths, 360 stations fixed with theodolite, and 180 with the prismatic compass. The trigonometrical observations of altitude numbered 271 and the barometrical observations 1,072. The party brought back 960 photographs, besides 6,250 specimens of rocks and fossils, and collections of the fauna and flora and anthropological objects.

The district between the River Limay and Lakes Lacar and Nahuel-Huapi, previously unknown to geographers, was surveyed for a plan on a scale of 1:400,000.

An exact preliminary plan of Lake Nahuel-Huapi presents an outline very different from that hitherto drawn on the maps.

The Fta-Leufú is identified with the River Frio, the Valley of the Diez y Seis de Octubre has been surveyed and the Carreuleufú is traced to its source in Lake General Paz, its hills and low lands.

The plains in which rise the affluents of the Rio Claro were carefully studied. It is in these plains that the interoceanic division of the waters occurs, at the distance of a hundred kilometres, at least, to the eastward of the Cordillera of the Andes.

Lakes Fontana and La Plata were explored to the mountain chain which bounds them in the neighborhood of the Pacific.

Not the least important work of the expedition was to find the best possible routes of communication between the Andes and the Atlantic. These were found to be two: one leading from Puerto San Antonio on the north side of the Gulf of San Matias to Valdivia, on the Chilian coast; the other from Tilly Road, on the Gulf of St. George, to Lakes Buenos Aires and Fontana, and northward through the Valley of the Diez y Seis de Octubre to Lake Nahuel-Huapi.

This interesting paper is illustrated by a large folding map and 42 plates.

Drs. Wehrli and Burckhardt contribute to the same volume their Preliminary Report on a geological expedition, in 1897, to the portion of the Andine Cordillera comprised between the parallels of 33° and 36° S. Latitude.

A paper entitled *Guayaquis y Anamitas*, by Dr. F. Lahille, is very

pleasant reading. Dr. Lahille gives the floor to his friend Gen. Frey, who traces the origin of the Guayaquis to the Annamites by the following easy steps in etymology:

The root *ga*, *gua*, *go*, etc., which seems to exist in the French word *gens*, is also found in Annamite in the word *guoye* or *nguoye*, which means *man, he, she*. *Ya*, in Annamite as in Breton and in German, and *yes* in English, means: *I understand, I have comprehended, yes*. *Gua-ya* then, is the people who are in the habit of pronouncing the word *ya*, of saying, *yes, I have comprehended*.

This kind of learning is displayed through two pages, and Dr. Lahille cannot refrain from expressing his surprise that Gen. Frey has overlooked the obvious relation between the Guayaqui word *rupia* (wife, daughter) and the Sanskrit word *rupa* (cattle); after which he makes the unkind remark that

Everybody knows in what exaggerations and crazy fancies certain etymologists too often allow themselves to indulge.

Discussione delle Osservazioni Astronomiche Fatte dal Tenente di Vascello Lambergo Vannutelli, ad detto alla Seconda Spedizione Böttogo in Africa. Nota del Prof. Elia Millosevich, Astronomo del R. Osservatorio del Collegio Romano (from the Memorie della Società Geografica Italiana, Vol. VIII, 1898).

This pamphlet contains Prof. Millosevich's calculation and reduction of all the astronomical observations made by Lieut. Vannutelli, one of the few survivors of the unfortunate Böttogo expedition, massacred near Gobò on the 17th March, 1897.

The observations were taken with a sextant (Troughton and Simms) and were generally double altitudes of stars and distances of the moon from the sun and from the usual stars and planets.

The latitudes of many places were determined by meridian observations and in some cases also by circummeridian observations of stars. The longitudes taken were fewer and less satisfactory, all deduced from lunar distances, the only available method under the conditions of travel, which made the transport of a chronometer a hopeless task. A telescope, for instance, to observe the eclipses of the satellites of Jupiter, would infallibly have been broken, sooner or later, a fate which overtook all the delicate instruments of the party, including even the pocket watches. Only the sextant escaped.

Prof. Millosevich gives the following list of latitudes and longitudes:

- 132 latitudes calculated, 79 latitudes of places determined.
- 63 longitudes calculated, 14 longitudes determined.
- 6 approximate determinations of magnetic declination.

Geographical Notes, from the T'oung-Pao, Vol. IX, No. 3. By G. Schlegel.

These Notes continue the series of monographs on Chinese geographical questions, intended by Prof. Schlegel to serve as materials for a complete treatise on ancient Chinese geography.

Note I is on the Nicobar and Andaman islands; Note II on Lang-ga-siu (Tantalam in the Malay Peninsula) and Ceylon.

In the Chinese records the Nicobar islands are known as the *Demons Who Devour Men*, from the belief that the inhabitants were cannibals. The people of the islands are described as very ugly, with red hair, black bodies, teeth like those of beasts and hawk-like claws.

Prof. Schlegel identifies the Hat Island (*Mo-shan*) of the Chinese with the middle island of the group, on Sombrero Channel.

The Andaman islanders go naked, and the Chinese tradition is that when Sakya Buddha passed the islands he stopped to bathe and his robe was stolen. To punish the people, Buddha swore that if they wore clothes thereafter their flesh should decay. It does not break the force of the tradition to remember that Buddha never saw the Andaman islands.

Orizaba and Popocatepetl.

Messrs. W. A. Cogshall and A. E. Douglass send a reprint of their papers in *Appalachia*, Vol. VIII, No. 4, 1898, on the ascent of Orizaba and Popocatepetl. Mr. Cogshall's ascent was made in April, 1897, without serious incident other than the feat performed by a Mexican guide, who went back to get coloured glasses for the party. He started at two o'clock in the afternoon, got the glasses, and overtook the party at four o'clock the next morning; a journey of fully thirty miles on foot, with a descent of 3,000 feet and an ascent of 5,000.

Mr. Douglass tabulates and compares various measurements of the mountains and obtains the following result:

Popocatepetl... $17,660 \pm 50$ feet, or 5384 ± 15 metres.

Orizaba..... $18,240 \pm 160$ feet, or 5560 ± 50 metres.

Mr. Douglass's experience of high-mountain climbing is summed up in a second paper.

He finds that if nausea occurs at night it will be relieved when day comes, but if it occurs by day, the climber should turn back at once. There is this unexplained difference between night and day. An abnormally high pulse at night is not serious, unless sleep is

prevented; for with the loss of sleep exhaustion ensues and further climbing may be stopped.

The headache seems to be inevitable at a high elevation, and it generally persists for some time after return to a lower level.

In most cases of hemorrhage there is time for descent to a lower altitude, and this gives relief.

When scientific work is to be done at a great elevation, Mr. Douglass recommends Mr. Whympers plan of remaining two or three days at a height of about 16,000 feet before beginning work.

The food should be of the kind most easily digested, beef tea, broths, etc. Bread without butter, toasted before an open fire, and water as hot as one can drink it, give tone to the stomach. Alcoholic stimulants may occasionally be of use, but generally they are to be avoided.

Au Pays des Ba-Rotsi Haut-Zambèze, Voyage d'Exploration en Afrique et Retour par les Chutes Victoria, le Matabélèland, le Transvaal, Natal, le Cap. Ouvrage Illustré de 105 Gravures et de Deux Cartes. Alfred Bertrand, Membre de la Société de Géographie de Genève, Membre de la Société Royale de Géographie de Londres, Membre de la Société de Géographie de Paris. 8°. Paris, Librairie Hachette et Cie., 79 Boulevard Saint-Germain. 1898.

M. Bertrand was one of four Europeans engaged in the expedition described in his book; the others being Capt. A. Saint-Hill Gibbons, at the head of the party, Mr. Percy C. Reid and Mr. F. D. Pirie. The book is in three parts: the Diary, of nearly 300 pages, and two Appendices, one of 15, the other of 10 pages.

The Diary begins with the start from Southampton, March 23, 1895, and closes with the return to the same port, March 2, 1896.

Interested in everything that came before his eyes, M. Bertrand records his impressions briefly and simply, without any attempt at fine writing. He made the journey from Cape Town to the Zambezi and back again without seeking adventure, but taking it as it came, in the march through the wooded country or the great "thirst land." Writing of his personal experiences, he keeps himself in the background and has nothing to say of his own exploits. Others of the party killed lions; M. Bertrand passed a night in a tree, waiting to shoot a lion that never came.

Of the native kings with whom he spoke Khama was the most remarkable; a monarch who has had the intelligence to forbid traffic in spirituous liquors in his dominions. He is a convert to

Christianity and to the European costume; it is a pity that his tailor is not an artist.

M. Bertrand thinks highly of the work done by the Swiss missionaries among the Ba-Rotsi, evidently not because they are Swiss, but because they are faithful and intelligent men striving to do all the good in their power.

It is not easy, M. Bertrand thinks, to make a comparison between the Victoria Falls of the Zambezi and Niagara, which is perhaps the more imposing from the volume of water, though the African falls are decidedly more picturesque, and their volume must be greatly increased in the rainy season.

The first Appendix gives a summary account of the Ba-Rotsi, their tribes, religion, manners and customs, and the resources of their country, which is bounded, roughly speaking, by the 12th and 18th degrees of south latitude and the 20th and 29th degrees of east longitude.

M. Louis Jalla, a missionary established at Kazungula, communicated the results of 10 years' observations of temperature, as follows:

Mean for the Hot Season (end of October):

Day, 39°-40° Cent. (102°-104° Fahr.).

Night, 20°-22° Cent. (68°-72° Fahr.).

Mean for the Cold Season (May, June, July):

Day, 24°-25° Cent. (75°-77° Fahr.).

Night, 6°-10° Cent. (43°-50° Fahr.).

The climate is generally unhealthy, but the natives are well developed physically, industrious, intelligent, skilful workers in iron and wood, excellent boatmen and stout marchers. They have a gift for mechanics.

One of the missionaries, M. Coillard, affirms that the religious sentiment is more highly developed in the Zambezi people than in any other tribe of South Central Africa. They have neither idol nor fetish; they pay homage to the shades of their ancestors and worship also a supreme being (Nyambé), symbolized by the sun, and his wife, typified by the moon. These two produced, first the animals, and afterwards man. A conflict followed between man and Nyambé, and man was so intelligent that Nyambé took fright and climbed into heaven by a spider's web. He has since remained invisible.

Some of the tribes believe in metempsychosis and each man chooses the animal into which his soul shall pass after death.

The Ba-Rotsi cultivate sorghum, maize, millet, pea-nuts, sweet potatoes, mainoc, squashes, watermelons and tobacco, and they raise cattle of two breeds, goats, sheep and poultry.

The second Appendix condenses the reports of the expedition published in the *Geographical Journal* for February, 1897.

M. Bertrand's figures are generally correct, but he, or his printer, has gone wrong on page 280, in giving to the colony of Natal an area of 32,000 square kilometres,

—equal to the united area of England and Wales.

Natal contains about 50,000 square kilometres; England has 151,048.

Most of the illustrations in this very handsome volume are from photographs by the author.

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JULY-OCTOBER, 1898.

BY PURCHASE.

Louis Agassiz : *His Life and Correspondence*, edited by Elizabeth Cary Agassiz, Boston, 1886, 2 vols., 8vo; *The Jesuit Relations and Allied Documents*, edited by Reuben Gold Thwaites, Vols. XXI to XXVIII, Cleveland, 1898, 8vo; *The United States*, by Henry Gannett (*Stanford's Compendium of Geography and Travel*, North America, Vol. II), London, 1898, 8vo; *Bibliographie Brésilienne*, par A. L. Garraux, Paris, 1898, 8vo; *The Annual Cyclopædia*, 1897, New York, 1898, 8vo; *Au Cap Nord : Itinéraires en Norvège, Suède, Finlande*, par Charles Rabot, Paris, 1898, 16mo; *The Cliff-Dwellers of the Mesa Verde, Southwestern Colorado*, by G. Nordenskiöld, Stockholm (1893), folio; *Dictionary of National Biography*, edited by Sidney Lee, Vols. LV and LVI, London, 1898, 8vo; *Compte-Rendu, Congrès International Colonial, XIV Section*, Bruxelles, 1898, 8vo; *Douze Ans en Abyssinie*, par Paul de Lauribar, Paris, 1898, 12mo; *Vers le Nil Français avec la Mission Marchand*, par Ch. Castellani, Paris (1898), 8vo; *The Records of New Amsterdam from 1653 to 1674*, edited by Berthold Fernow, New York, 1897, 7 vols., 8vo; *The Virginia Magazine of History and Biography*, edited by Philip A. Bruce, Vols. I-V, Richmond, 1894-1898, 8vo; *Reports of the Commission to locate the Site of the Frontier Forts of Pennsylvania (Harrisburg)*, 1896, 2 vols., 8vo; *Neuer Handatlas*, von E. Debes, Leipzig, 1895, folio; *Aux Fjords de Norvège et aux Forêts de Suède*, par Charles Rabot, Paris, 1898, 16mo; *Kaart van Noord-Celebes (with pamphlet) door H. Ph. Th. Witkamp*, Amsterdam, 1898, sheet, in case; *Le Japon Vrai*, par Félix Martin, Paris, 1898, 12mo; *Leçons de Géographie Physique*, par A. de Laparent, 2^{me} Édition, Paris, 1898, 8vo; *Forma Urbis Romæ*, Rodolphus Lanciani, Fasc. VI, Mediolani, 1898, folio; *The Oxyrhynchus Papyri, Part I*, by B. P. Grenfell and Arthur S. Hunt (*Græco-Roman Branch, Egypt Exploration Fund*), London, 1898, 8vo; *The Traveller's Guide*, by J. J. Morse and R. C. Morse, New Haven, 1823, 16mo; *New English and Italian Dictionary*, by John Millhouse, 5th edition, New York, 1886, 2 vols., 8vo; *Five Years in Damascus*, by J. L. Porter, 2d edition, London, 1870, 8vo; *Florida : its Scenery, Climate and History*, by Sidney Lanier, Philadelphia, 1876, 12mo; *A Century of Dishonor, U. S. Government's Dealings with some of the Indian Tribes*, by H. H. (Helen Hunt Jackson), New York, 1881, 12mo; *Two Campaigns : Madagascar and Ashantee*, by Bennet Burleigh, London, 1896, 8vo; *Abel Janszoon Tasman's Journal : Van Diemens Land and New Zealand*, by J. E. Heeres and W. Van Bemmelen, Amsterdam, 1898, folio; *The Natives of Sarawak and British North Borneo*, by Henry Ling Roth, London, 1896, 2 vols., 8vo; *A Servant of "John Company," Recollections of an Indian Official*, by H. G. Keene, London, 1897, 8vo; *The Heart and Songs of the Spanish Sierras*, by Geo. Whit White, London, 1894, 8vo; *Australia Twice Traversed*, by Ernest Giles, London, 1889, 2 vols., 8vo; *Rambles in the Black Forest*, by Henry W. Wolff, London, 1890, 8vo; *Twenty-five Years in British Guiana*, by Henry Kirke, London, 1898, 8vo; *In an Enchanted Island*, by W. H. Mallock, London, 1889, 8vo; *Too Late for Gordon and Khartoum*, by Alex. Macdonald, London, 1887, 8vo; *Through*

South Africa, by Henry M. Stanley, London, 1898, 8vo; Roughing it in Siberia, by Robert L. Jefferson, London, 1897, 8vo; Cardinal Lavigerie and the African Slave-Trade, by Richard F. Clarke, S.J., London, 1889, 8vo; A Year in Brazil, by Hastings Charles Dent, London, 1886, 8vo; South African Sketches, by A. B. Ellis, London, 1887, 8vo; History of the Gold Coast of West Africa, by A. B. Ellis, London, 1893, 8vo; Blackbirding in the South Pacific, by W. B. Churchward, London, 1888, 8vo; The Outgoing Turk, by H. C. Thomson, London, 1897, 8vo; The Chitral Campaign, by H. C. Thomson, London, 1895, 8vo; Letters from Majorca, by Chas. W. Wood, London, 1888, 8vo; The Life of the Right Honourable Stratford Canning, etc., by Stanley Lane-Poole, London, 1888, 2 vols., 8vo; On Snowshoes to the Barren Grounds, by Caspar Whitney, London, 1896, 8vo; Through the Subarctic Forest, by Warburton Pike, London, 1896, 8vo; Days Spent on a Doge's Farm, by Margaret Symonds, London, 1893, 8vo; Sir Richard Church in Italy and Greece, by E. M. Church, Edinburgh and London, 1895, 8vo; Man-Hunting in the Desert: Palmer Search-Expedition, by Alfred E. Haynes, London, 1894, 8vo; In New South Africa, by H. Lincoln Tangye, London, 1896, 8vo; A Month in a Dandi: a Woman's Wanderings in Northern India, by Christina S. Bremner, London (1891), 8vo; In the Land of the Bora, or Camp Life and Sport in Dalmatia and the Herzegovina, by "Snaffle," London, 1897, 8vo; A Visit to Java, by W. Basil Worsfold, London, 1893, 8vo; South Africa, by W. Basil Worsfold, London, 1895, 8vo; Exploration and Hunting in Central Africa, by A. St. H. Gibbons, London, 1898, 8vo; The Benin Massacre, by Alan Boisragon, London, 1897, 8vo; Benin, the City of Blood, by R. H. Bacon, London, 1897, 8vo; Glimpses of Italian Society, by Mrs. Piozzi, London, 1892, 8vo; Through the Dolomites, by Alexander Robertson, London, 1896, 8vo; Gold, Sport and Coffee-Planting in Mysore, by Robert H. Elliot, Westminster, 1894, 8vo; Travels in Unknown Austria, by Princess Mary of Thurn and Taxis, London, 1896, 4to; The Real Chinaman, by Chester Holcombe, London, 1895, 8vo; The Thackerays in India, by Sir W. W. Hunter, London, 1897, sq. 8vo; Joseph Thomson, African Explorer, by J. B. Thomson, London, 1896, 8vo; Pioneer Work in the Alps of New Zealand, by Arthur P. Harper, London, 1896, 8vo; On the Indian Hills, or Coffee-Planting in Southern India, by Edwin Lester Arnold, London, 1893, 8vo; Under the Dragon Throne, by L. T. Meade and R. K. Douglas, London (1897), 8vo; Far Cathay and Farther India, by Gen. A. Ruxton Mac Mahon, London, 1893, 8vo; Among the Pagodas and Fair Ladies, by Gwendolen French Gascoigne, London, 1896, 8vo; A Tour through the Famine Districts of India, by F. H. S. Merewether, London, 1898, 8vo; Life of Brian Houghton Hodgson, by Sir W. W. Hunter, London, 1896, 8vo; Untrodden Paths in Roumania, by Mrs. Walker, London, 1888, 8vo; Over the Andes: Argentine to Chili and Peru, by May Crommelin, London, 1896, 8vo; Climbing Reminiscences of the Dolomites, by Leone Sinigaglia, London, 1896, 8vo; A Summer in Kieff, by Isabel Morris, London (1891), 8vo; Seas and Lands, by Sir Edwin Arnold, London, 1891, 8vo; Woman in India, by Mary Frances Billington, London, 1895, 8vo; Jerusalem, the City of Herod and Saladin, by Walter Besant and E. H. Palmer, London, 1871, 8vo; Frontier Lands of the Christian and the Turk, by (James Henry Skene), London, 1853, 2 vols., 8vo; The Holy Roman Empire, by James Bryce, 3d edition, London, 1871, 8vo.

GIFTS.

From Joseph Britton, San Francisco:

Charter for the City and County of San Francisco, San Francisco, 1898, 8vo.

From W. A. Cogshall and A. E. Douglass, Authors:

A Trip to the Summit of Orizaba, by W. A. Cogshall; The Altitudes of Orizaba

and Popocatepetl, Effects of High-mountain Climbing, by A. E. Douglass, p., 8vo (reprint).

From Levi Holbrook :

The Financial and Commercial Chronicle, Vols. LXII and LXIII, New York, 1896, folio.

From Elia Millosevich, Author :

Discussione delle Osservazioni Astronomiche fatte dal Tenente di Vascello Lamberto Vannutelli, Roma, 1898, p., 8vo. (reprint).

From M. Niemeyer, Publisher, Halle :

Die Reste der Germanen am Schwarzen Meere, von Richard Loewe, Halle, 1898, 8vo.

From the N. Y. Produce Exchange, New York :

Annual Report, 1897-98, New York, 1898, 8vo.

From Miss Luella Agnes Owen, Author :

Cave Regions of the Ozarks and Black Hills, by Luella Agnes Owen, *Membre titulaire de la Société de Spéléologie, and Fellow of the American Geographical Society.* Cincinnati, The Editor Publishing Co., 1898.

From Mrs. C. F. Palmer :

Inebriety, its Source, Prevention and Cure, by Charles Follen Palmer, New York, 1898, 12mo.

From P. Lee Phillips, Author :

Alaska and the Northwest part of North America 1588-1898: Maps in the Library of Congress, Washington, 1898, pr., 8vo.

From E. L. Plumb :

A Description of the Mexican Cotton Estates of Tlahualilo, by C. P. Mac Kie, New York, 1897, p., 8vo. (reprint).

From G. Schlegel, Author :

Geographical Notes : Nicobar and Andaman Islands, Lang-ga-siu, Ceylan.—Leyden, 1898, pr., 8vo. (reprint).

From the Southern Railway Company, Washington :

The Southland, by Frank Presbrey, Washington (1898), 4to.

NOTES AND NEWS.

Letters received from Mr. Peary, under date of August 13, state that the season was unusually late, with abundance of ice around Cape York. The Eskimos had deserted their village, as he believed, on account of the heavy ice, in order to look elsewhere for seals.

Mr. Peary wrote from Etah, near the entrance to Smith Sound, and was about to push on in the *Windward* to his winter quarters in North-West Greenland. He had with him ten Eskimos and sixty dogs, with an ample supply of walrus meat for dog food. He had more volunteers than he could accept, and the death of their four tribesmen in New York made no difference in his relations with the Arctic Highlanders. Nothing had been seen of the *Fram*.

A telegram from St. John's, N. F., of October 18 reports that Captain William Bartlett, brother of Captain John Bartlett, commander of the *Windward*, has arrived from a summer's fishing at Turnavick, Labrador, where Captain John Bartlett intended calling for him on the *Windward's* homeward trip from Greenland.

Captain Bartlett declares that he never knew the ice to form more rapidly and heavily than while on his way here, and he has almost abandoned hope that the *Windward* will escape from Arctic regions this autumn.

The Allahabad *Pioneer* records the arrival in India of Mr. Cobbold, from an exploring trip in southern Siberia. He says that near Lake Balkash, where the thermometer occasionally registered thirty degrees below zero, he found a great number of long-haired tigers, which feed upon herds of wild hogs that frequent the jungle around the lake. Mr. Cobbold crossed the Alan Tau mountain range in the Russian Pamirs. He obtained many specimens of gold, silver, copper and iron. This range is inexhaustibly rich in minerals. Central Asia, a hundred years hence, will, he thinks, be the richest mining country in the world.

Col. George Earl Church, who was chosen President of the Geographical Section, at the Bristol meeting of the British Association in September, addressed the Section on *Argentine Geography and the Ancient Pampean Sea*.

His address, which fills thirteen closely-printed pages, gives the results of more than forty years' study and personal observation as a surveyor and explorer in the vast region of the La Plata basin.

The ancient Sea extended from $10^{\circ} 44'$ S. Lat. to the Atlantic, between Uruguay and the Tandil Sierra:

It was probably about 1,400 miles in length, with an average width of above 400 miles. Roughly estimated, its area must have been about 600,000 square miles—say about two-thirds the size of the Mediterranean Sea.

The area of the ancient Mojos Lake (in the north) was about 115,000 square miles, being seven-tenths that of the Black Sea, and exceeding that of the five "Great Lakes" of North America, which is 93,581 square miles. The relation of the Pampean Sea to the Mojos Lake was similar to that of the Mediterranean Sea to the Black Sea.

Traces of it are still observable, notably the great, low, flooded morass of Xarayas on the Upper Paraguay River, and the ancient delta of the Paraná, including the Ybará lagoon. The Salina Grande was also an arm of it—a great inland fiord. The sea, moreover, must have covered large areas of Paraguay, Corrientes, Entre Rios, and Uruguay, and, before the uplifting of the country, it extended south-west to the rivers Chadi-Leofu and the Colorado, lapping round the southern slope of the Ventana range until the curved rim, concave to the north-east, which connects this with the Sierra de Cordova, was sufficiently elevated to completely cut off its south-western extension. This rim, for the first fifty miles, starting at the Ventana, is about 700 to 750 feet above the sea, and shows much *tosca** rock near the surface. It afterwards rises rapidly towards the Cordova sierra.

The bed of this great sea was apparently raised to its present level by a slow, general upheaval of the Andes from west to east.

Col. Church is inclined to believe that the cubic volume of the stream which poured into the Pampean Sea was equal to twice that which the Mississippi now sends into the Gulf of Mexico, and he estimates the age of the Pampean formation at about 70,000 years.

The *Université Nouvelle*, of Brussels, founded on the 18th of March last a Geographical Institute, which is not bound to follow a programme dictated by a Higher Council of Public Instruction. This burdensome obligation being set aside, the *Université Nouvelle* has adopted the following plan of studies:

Preparatory Course—

Natural History, Physics, Mathematics, Geography, History and Chronology, Languages—English, German, Russian, Italian, Spanish, Portuguese—Drawing.

First Year—

Cosmography, Geography, Mathematical and Physical; Meteorology, Geology, Biology, Languages, Drawing, Photography of Maps, Reliefs.

Second Year—

Cosmography and Mathematical Geography, Physical Geography, with Meteorology and Hydrology, Geology and Palæontology, Botanical Geography, Anthropology, Languages, Drawing, Map Construction and Reliefs.

Third Year—

Geodesy, Geological Structure of the Globe, Zoological Geography, Anthropology,

* Elsewhere explained as equivalent to *tufa*.

Medical Geography, Ethnography, with Colonisation, History of Geography (Palæogeography and Portolani), Comparative Geography, Toponymy, Commercial and Statistical Geography, Map Construction, Reliefs, Instruments and Apparatus.

Each year there will be excursions and journeys by land and sea.

The studies will include memoirs, to be published by the Institute. The maps and reliefs will be so constructed that the *Université Nouvelle* may accept them as its own and publish them.

Students entered in the Geographical Institute will pay the University dues, and will bear, in addition, the expense of the excursions. The library and map collections will be open to all the students, who will be asked to contribute for the general use such geographical works as they possess.

The Institute desires to enter into relations of exchange with geographical societies: Address: rue des Minimes 21, Brussels.

THE COLLEGE OF COMMERCE IN THE UNIVERSITY OF CALIFORNIA.—At the Commencement of the University of California on the 18th of May last the President, Martin Kellogg, among other important matters, announced that the Board of Regents had established the College of Commerce; and that they had secured the services of a distinguished scientist, Prof. George Davidson, for the chair of geography. The College commenced its official life by the act of the Regents when they adopted the clear and comprehensive report of the Special Committee appointed for that purpose.

This brief announcement was supplemented and expanded in the Commencement Address of Prof. Edmund J. James, of the University of Chicago. The title of his address was suggestive, "The University and its Relation to Practical Life." He rapidly sketched the great features and purposes of a university; of the oldest universities; and of universities provided in different countries for the special benefit of those countries at given epochs. In the latter part of his discourse he came to the practical needs and demands of the present day in the United States. He granted the largest culture in the University, but declared for a thorough knowledge of the laws of finance (his own special study), for a proper outfit for men in the management of great modern industrial organizations, for education in diplomatic and consular law and intercourse, and for an equipment in the laws, usages and demands of commerce in its thousand ramifications, etc.

He pointed out that every great producing country was seeking new markets, and struggling for the mastery and control of the countries and commerce of the world. He contended that those who entered upon these and cognate careers were entitled to all

that a university could give just as much as those who studied the humanities, law and medicine.

He showed the prime necessity for a College of Commerce upon the Pacific coast of the United States, where the whole trade of the countries bordering the Pacific, and the islands of the Pacific, lay directly within reach of the ports of the three states of California, Oregon and Washington.

This was the first College of Commerce organized by any university, and he believed it would expand to embrace all subject matters of finance and diplomacy.

The *Société de Géographie de Dunkerque*, hitherto absorbed in the *Union Géographique du Nord*, published in June last the first number of an independent quarterly Bulletin, devoted to the interests of Dunkirk and to commercial and to general geography. A special feature of this new periodical is a *Revue des Ports*, giving statistics of the commerce of Dunkirk and comparative statements of tonnage entered at French, Belgian, German and other ports.

With this useful information the *Bulletin* furnishes also the agreeable in a letter from Pierre Loti, who writes from Madrid to excuse himself for holding back a promised contribution:

So many things have upset my life that, I assure you, I could not do otherwise.

The contribution appears in the *Bulletin* of September 15, with the title: *An Audience of the Sphinx*, in two pages, as effective in their way as Kinglake's in Eöthen.

A communication from the *Sociedad Geográfica de Lima*, under date of August 1, brings tidings of the loss sustained by that active Society in the death of Dr. Luis Carranza, its able and accomplished president for the past eight years.

The Bordeaux *Société de Géographie Commerciale* announces the death, on the 15th of September, of M. Jacques Gebelin, professor in the University of Bordeaux and for the last sixteen years principal editor of the Society's *Bulletin*.

At the meeting of the Society, November 14, 1898, Mr. George Byron Gordon of the Peabody Museum, Cambridge, will give an account of the work of the Museum in the exploration of Copan, Honduras.

On the 12th of December Mr. Cosmos Mindeleff will address the Society on the subject of American Aboriginal Architecture, in the United States.

HONORARY AND CORRESPONDING MEMBERS AND FELLOWS.

HONORARY MEMBERS.

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| <p>DUFFERIN and AVA, the Marquis of.
 HARMSWORTH, Alfred Charles, London.
 MARKHAM, Sir Clements R., K.C.B.,
 President of the Royal Geographical
 Society.
 MCCLINTOCK, Admiral Sir F. L., R.N.,
 K.C.B.</p> | <p>NANSEN, Dr. Fridtjof, Christiania.
 NARES, Rear-Admiral Sir George S.,
 R.N., K.C.B.
 NORDENSKIÖLD, Baron A. E., Stock-
 holm.
 PEARY, Civil Engineer R. E., U.S.N.</p> |
|---|--|

CORRESPONDING MEMBERS.

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| <p>ABBE, Prof. Cleveland, Washington.
 BONAPARTE, Prince Roland, Paris.
 BOWEN, Rt. Hon. Sir George Ferguson,
 G.C.M.G., London.
 BREWER, Prof. Wm. H., New Haven.
 BROWNLEE, Harrison J., C.E., Vancouver.
 CHAIX, Prof. Paul, Geneva, Switzerland.
 CHAIX, Prof. Emile, Geneva, Switzerland.
 COELLO y QUESADA, Don F., President
 of the Madrid Geographical Society.
 CORA, Prof. Guido, Rome.
 DAVIDSON, Prof. Geo., San Francisco.
 DU CHAILLU, Paul B.
 FISKE, Prof. John, Cambridge, Mass.
 GANNETT, Henry, Washington, D. C.
 GARDNER, Prof. James T., Albany.
 GILLIODTS VAN SEVEREN, L., LL.D.,
 Bruges.
 GILMAN, Daniel C., LL.D., President
 Johns Hopkins University, Baltimore.
 GOBAT, Dr. A., Nat. Councillor, Berne.
 GRIGORIEV, Alex. V., Sec'y Imp. Russian
 Geographical Society, St. Petersburg.
 JACKSON, Frederick George, London.
 LAPPARENT, Prof. A. de, Paris.
 LECLERCQ, Jules, Brussels.
 LONG, Col. C. Chaillé.</p> | <p>LUCE, Rear-Admiral S. B., U.S.N.
 LUMHOLTZ, Carl, M.A., Christiania,
 Norway.
 MAUNOIR, Charlès, Paris.
 MCCARTEE, D. Bethune, M.D., New
 York.
 NEY, Count Napoléon, Paris.
 PACKARD, Prof. A. S., Providence, R. I.
 PEET, Rev. S. D., Chicago, Ill.
 PERALTA, Manuel M. de, Liege.
 PROUT, Henry G.
 PUMPELLY, Prof. Raphael.
 ROMERO, Matias, Envoy of Mexico at
 Washington.
 SEMENOV, Peter P., Vice-Prest. Imp.
 Russ. Geog. Soc., St. Petersburg.
 STANLEY, Henry M.
 TACHÉ, E. E., Asst. Commissioner of
 Crown Lands, Quebec.
 VINCENT, Frank, New York.
 VON DEN STEINEN, Prof. Dr. Karl,
 Berlin.
 WHITEHOUSE, Cope.
 WRIGHT, Gen. Horatio G., U.S.A.,
 Washington.
 WYSE, Lieut.-Com. Lucien N. B., Paris.</p> |
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Date of Election.

- 1875 Beaman, Charles C.
- 1875 Beekman, Gerard.
- 1875 Brownell, Silas B.
- 1875 Beste, Henry.
- 1878 Brown, Rev. Philip A. H.
- 1878 Brown, J. Romaine.
- 1881 Babcock, Samuel D.
- 1882 Baldwin, Octavius D.
- 1882 Barney, Newcomb C.
- 1883 Baker, Cyrus O.
- 1883 Banta, Theodore M.
- 1883 Bergen, Tunis G.
- 1883 Bennett, Ludovic.
- 1883 Blake, Frederick D.
- 1883 Bell, Capt. W. R.
- 1883 Benson, Frank Sherman.
- 1884 Bangs, Fletcher H.
- 1884 Brookfield, William.
- 1885 Bliss, George T.
- 1886 Bridgman, E. C.
- 1886 Bowers, John M.
- 1886 Backus, J. Bayard.
- 1886 Bouvier, M. C.
- 1886 Beddall, Edward F.
- 1886 Berwind, Edward J.
- 1886 Bond, Frank S.
- 1887 Blagden, George.
- 1887 Berrian, Charles M.
- 1887 Bend, George H.
- 1888 Bogert, S. G.
- 1888 Bruce, Sanders D.
- 1888 Burgess, Prof. John W.
- 1888 Bacon, Lathrop R.
- 1888 Beers, M. H.
- 1888 Barstow, J. Whitney, M.D.,
Flushing, N. Y.
- 1889 Bromberg, Fredk. G., Mobile, Ala.
- 1889 Biddle, Edward R.
- 1889 Baring, Thos.
- 1889 Brown, Wm. Reynolds.
- 1889 Bleything, Geo. Dacre, M.D.
- 1890 Benedict, Jas. H.
- 1890 Barnard, Jno. F., Council Bluffs.
- 1890 Brooker, Chas. F.,
Torrington, Conn.
- 1890 Bertschmann, J., Swiss Consul.
- 1890 Bushnell, Jos.
- 1890 Bergen, Jas. C.
- 1890 Brewster, C. O.
- 1891 Bernheim, Gustav.

Date of Election.

- 1891 Babcock, Stephen E.,
Little Falls, N. Y.
- 1891 Belin, Henry, Jr., Scranton, Pa.
- 1891 Boies, H. M., Scranton, Pa.
- 1891 Barber, Amzi L.
- 1891 Besly, Chas. Howard, Chicago.
- 1891 Brice, Hon. Calvin S.
- 1891 Bogue, Virgil G., Chicago.
- 1891 Bell, Ed. W.
- 1891 Blanchard, Jas. A.
- 1892 Brandreth, Wm.
- 1893 Birdsall, Mrs. W. R.
- 1893 Brigham, Edward Morris,
Battle Creek, Mich.
- 1894 Baiz, Jacobo.
- 1895 Bradley, Edson.
- 1895 Boas, Emil L.
- 1895 Bien, Joseph R.
- 1895 Butler, Joseph G., Jr.
- 1895 Beal, Wm. R.
- 1896 Burgess, Thos. F.
- 1897 Biddle, Anthony J. Drexel,
Philadelphia.
- 1897 Biederbick, Henry, Hoboken, N. J.
- 1897 Bell, Dr. Ralcy H., Atlanta, Ga.
- 1897 Belding, Milo M., Jr.
- 1897 Bunker, Matthew.
- 1897 Booth-Tucker, Fred. de L.
- 1897 Bacon, Selden.
- 1897 Ballin, Jacques.
- 1897 Billings, Dr. J. S.
- 1897 Brooks, Geo. G.
- 1897 Billings, Frederick.
- 1897 Burdge, Franklin.
- 1897 Benjamin, Morris W.
- 1897 Bradley, Chas. W.
- 1897 Blodgett, Mrs. Wm. T.
- 1898 Blake, Theodore A., New Haven.
- 1898 Brydges, Rev. Ralph L.,
Islip, N. Y.
- 1898 Beer, William, New Orleans.
- 1898 Burr, Prof. Wm. H.
- 1898 Batchelor, Charles.
- 1898 Barnes, Chas. J., Chicago.
- 1874 Church, Col. George E., London.
- 1874 Conyngham, Wm. L.
- 1875 Cameron, Sir Roderick W.
- 1879 Coddington, Gilbert S.
- 1881 Clinton, Henry L.

Date of Election.

- 1882 *Clarkson, Banyer.*
 1883 *Chapman, Henry E.*
 1884 *Clafin, John.*
 1884 *Connor, W. E.*
 1886 *Colvin, Verplanck, Albany, N. Y.*
 1886 *Carter, Henry C.*
 1886 *Chauncey, Elihu.*
 1887 *Cranitch, William I. A.*
 1888 *Coutan, Adolphe R.*
 1888 *Coutan, Charles Albert.*
 1888 *Cochran, William F.*
 1889 *Coxe, Henry B.*
 1889 *Carter, John J., Titusville, Pa.*
 1897 *Comstock, Frederick H.*
 1897 *Chapin, Chester W.*
 1856 *Cooper, Hon. Edward.*
 1868 *Chapman, Joseph H.*
 1874 *Constable, James M.*
 1874 *Crosby, Hon. J. Schuyler.*
 1874 *Colgate, James B.*
 1874 *Constantine, Andrew J.*
 1874 *Crocker, Geo. A.*
 1876 *Curtis, Benj. L.*
 1882 *Coudert, F. R., LL.D.*
 1882 *Conkling, Rev. N. W., D.D.*
 1883 *Clyde, W. P.*
 1883 *Clews, Henry.*
 1884 *Carey, Henry T.*
 1886 *Conger, Clarence R.*
 1886 *Coffin, Edmund.*
 1886 *Church, Benjamin S.*
 1886 *Corthell, E. L., Chicago.*
 1886 *Clarke, Stephen G.*
 1886 *Clarke, C. C.*
 1886 *Calder, George.*
 1887 *Clark, Jefferson.*
 1887 *Cannon, H. W.*
 1887 *Compton, A. T.*
 1888 *Colgate, Abner W.*
 1888 *Crimmins, John D.*
 1888 *Chase, George.*
 1888 *Cook, Henry H.*
 1888 *Canda, Chas. J.*
 1888 *Coleman, James S.*
 1888 *Chrystie, Wm. F.*
 1888 *Chisolm, George E.*
 1889 *Clark, Chas. F.*
 1889 *Crane, Chas. R., Chicago.*
 1889 *Clausen, George C.*
 1889 *Comstock, Geo. Carlton.*

Date of Election.

- 1889 *Cole, Eugene M.*
 1890 *Chanler, Wm. Astor.*
 1890 *Carter, A.*
 1890 *Cockcroft, Miss Mary T.*
 1890 *Carnrick, Jno.*
 1891 *Cohen, Sam'l M.*
 1891 *Cogswell, W. B., Syracuse.*
 1891 *Clapp, Geo. H., Pittsburg.*
 1891 *Cook, J. Hervey,*
 Fishkill-on-Hudson.
 1891 *Cooper, John.*
 1892 *Comer, John H.*
 1893 *Coolidge, J. Randolph, Boston.*
 1893 *Crawford, Francis.*
 1893 *Cummings, Thos. H., Boston.*
 1894 *Cook, F. A., M.D.*
 1894 *Carey, Wm. Francis.*
 1895 *Carter, Walter S.*
 1897 *Chamberlain, Rev. L. T.*
 1897 *Corning, G. M.*
 1897 *Cameron, W. L.*
 1897 *Chambers, Frank R.*
 1897 *Church, Geo. H.*
 1897 *Coffin, C. A.*
 1897 *Chamberlain, Rev. John.*
 1897 *Combe, Mrs. William.*
 1897 *Cassard, Wm. J.*
 1898 *Cook, Eugene B., Hoboken.*
 1898 *Carmalt, Dr. W. H., New Haven.*
 1898 *Cox, A. Beekman,*
 Cherry Valley, N. Y.
 1898 *Clous, Lieut.-Col. J. W., U. S. A.*
 1898 *Cuttin, Prof. Thos. L.,*
 Darlington, S. C.
 1898 *Curtis, Osborn Marcus.*
 1898 *Cross, F. C., Luling, Tex.*
 1855 *Daly, Charles P., LL.D.*
 1874 *de Peyster, Gen. J. Watts.*
 1874 *Dunscombe, Richard T.*
 1874 *Du Bois, Wm. A.*
 1875 *de Peyster, Frederic J.*
 1877 *Davis, Joseph Beale, Orange, N. J.*
 1880 *Deane, John H.*
 1880 *Dexter, Henry.*
 1880 *Deen, William M.*
 1881 *Dockarty, Augustus T.*
 1882 *Dunlap, Robert.*
 1884 *Douglas, James.*
 1885 *Dupré, Ovide.*

Date of Election.

- 1886 *de Lancey, Edward F.*
 1887 *Doudge, James R.*
 1888 *Davenport, Hon. Ira, Bath, N. Y.*
 1889 *Donald, Peter.*
 1890 *Dinsmore, C. Gray.*
 1856 Douglass, Andrew E.
 1856 Dodge, Wm. E.
 1871 Daly, Hon. Joseph F.
 1874 Delafield, M. L.
 1874 Dun, R. G.
 1875 Davies, Julien T.
 1875 Davison, Charles A.
 1875 Dommerich, L. F.
 1880 Du Bois, Frederick N.
 1883 Decker, Jos. S.
 1884 Davis, Howland.
 1884 Dalley, Henry, Jr.
 1886 Dix, Rev. Morgan, D. D.
 1887 Dickson, John.
 1887 Davenport, W. F., M. D.
 1888 Dunham, James H.
 1888 Drexel, Mrs. Joseph W.
 1889 De Zeller, John R.
 1889 Dodd, S. C. T.
 1889 Durkee, Eugene W.
 1889 Dwight, Jonathan, Jr., M. D.
 1889 Dupont, Col. H. A.,
 Wilmington, Del.
 1889 Daley, Geo. H.
 1889 Deal, W. E. F., Virginia City, Nev.
 1889 Dexter, Julius, Cincinnati.
 1890 Douglas, O. B., M. D.
 1890 Dellinger, Chas. F.
 1891 Drey, Max.
 1892 Daniels, W. L., Bayonne, N. J.
 1892 Draper, Mrs. Henry.
 1892 DeBuys, A.
 1893 Dodson, Robt. Bowman.
 1894 Dieterich, Chas. F.
 1894 Duvall, Wm. C.
 1894 Dean, C. W.
 1895 Daniels, Charles H.
 1895 Dessar, Leo C.
 1895 De Kalb, Courtenay.
 1896 Dodge, Richard E.
 1897 Delbridge, Chas. L., Atlanta.
 1897 Dillingham, Edwin R.
 1897 Doremus, R. Ogden, M. D.
 1897 Dodge, Rev. D. Stuart.
 1897 Dubourcq, Louis I.

Date of Election.

- 1897 Doughty, Mrs. Alla.
 1897 Dunnell, Rev. Wm. N.
 1897 Dunscomb, S. Whitney, Jr.
 1898 Davis, J. C. Bancroft, L. L. D.,
 Washington.
 1898 Dunham, Edward K., M. D.
 1898 Davidson, James W.,
 Tamsui, Formosa.
 1879 *Elliott, Samuel.*
 1882 *Emerson, J. W.*
 1882 *Ellis, Wilbur Dixon.*
 1882 *Earle, Joseph P.*
 1886 *Easton, Robert T. B.*
 1859 Evarts, Hon. William M.
 1868 Emmet, Thomas Addis, M. D.
 1874 Eaton, Prof. D. Cady,
 New Haven, Conn.
 1875 Ellis, John W.
 1877 Elderkin, John.
 1879 Earle, Ferdinand P.
 1880 Eckert, Gen. Thomas T.
 1882 Edwards, Hon. J. Pierrepont.
 1883 Eno, Amos F.
 1886 Ellis, Geo. W.
 1887 Elkins, Hon. S. B.
 1887 Egleston, Melville.
 1891 Eustis, W. E. C., Boston.
 1891 Edgerton, E. D., Helena, Mont.
 1891 Eyerman, John, Easton, Pa.
 1897 Eimer, August.
 1897 Ellison, John E.
 1898 Emmonds, J. Gordon.
 1874 *Fox, Austen G.*
 1886 *Flagler, H. M.*
 1888 *Ferguson, Walton,*
 Stamford, Conn.
 1889 *Fenton, David W.*
 1890 *Fearing, Daniel B., Newport, R. I.*
 1897 *Flanigan, William L.*
 1898 *Ferguson, Prof. Henry,*
 Hartford, Conn.
 1860 Field, Rev. H. M.
 1864 Faile, Thomas H.
 1871 Fliess, Wm. M.
 1873 Freedman, Hon. John J.
 1874 Farragut, Loyall.
 1875 Fargo, James C.
 1875 Fuller Charles D.

Date of Election.

- 1875 Ford, James B.
 1875 Folsom, George W.
 1881 Fearing, William H.
 1882 Fairbanks, Leland.
 1884 Frazer, Alfred.
 1887 Floyd, John Gelston.
 1889 Frazer, Everett.
 1889 Freeland, Theodore H.
 1889 Flint, Chas. R.
 1889 Freeman, Wm. C., Cornwall, Pa.
 1890 Fellowes, F. Wayland,

New Haven, Conn.

- 1890 Fairchild, Hon. Chas. S.

- 1890 Farnam, Henry W.,

New Haven, Conn.

- 1892 Fairchild, Samuel W.

- 1894 Frick, John.

- 1894 Fox, Andrew Jackson, M.D.

- 1894 Frazer, Horatio N.

- 1895 Foot, James D.

- 1896 Fanton, Hull.

- 1896 Farquhar, Edward Y.

- 1897 Ferguson, Wm. E.

- 1897 Fitz Gibbon, Edward.

- 1898 Fearons, Geo. H.,

- 1868 Gebhard, William H.

- 1868 Gerry, Elbridge T.

- 1874 Gibbs, Theodore K.

- 1879 Graves, Arthur B.

- 1881 Grace, Hon. William R.

- 1883 Greenough, John.

- 1883 Goodridge, John C., Jr.

- 1886 Gunther, Franklin L.

- 1886 Goodwin, James J.

- 1887 Grosvenor, James B. M.

- 1889 Gage, E. B., Tombstone, Arizona.

- 1889 Gardner, John L., Boston.

- 1889 Gest, Erasmus, Reno, Nev.

- 1893 Gilbert, J. H. Grenville,

Ware, Mass.

- 1898 Goodnow, Lieut. Harold P., U.S.A.

- 1856 Greenwood, Isaac J.

- 1868 Green, Andrew H.

- 1872 Gerard, James W.

- 1879 Gay, Joseph E.

- 1881 Galloway, R. M.

- 1881 Garland, James A.

- 1882 Gardiner, J. Grahame.

- 1885 Glazier, Simon W.

Date of Election.

- 1885 Gibson, George Rutledge.

- 1886 Gallatin, Frederic.

- 1886 Godkin, E. L.

- 1887 Gould, George J.

- 1887 Gossler, Gustav H.

- 1888 Greene, Byron W.

- 1888 Grafton, Joseph.

- 1889 Gurnee, Augustus C.

- 1889 Gilbert, G. K., Washington, D. C.

- 1891 Greene, David M., Troy, N. Y.

- 1891 Gay, Edward, Mt. Vernon, N. Y.

- 1892 Greenwood, Langdon, Jr.

- 1892 Gutteridge, Rev. John A.,

Newark, N. J.

- 1894 Gherardi, Rear Adm. Bancroft,

U. S. N.

- 1894 Gibbs, John Wilson, M.D.

- 1894 Gould, Linus A.

- 1895 Greeff, Ernest F.

- 1897 Gunther, Charles B.

- 1897 Grossmann, Ignatius R.

- 1897 Garver, John A.

- 1897 Gibbs, Fredk. S.

- 1897 Gleason, John J.

- 1897 Greene, D.

- 1897 Gruber, Abraham.

- 1897 Grosvenor, Rev. Wm. M.

- 1897 Green, Fredk. V.

- 1897 Golding, John Noble.

- 1898 Green, Samuel Swett,

Worcester, Mass.

- 1898 Goodridge, Mrs. Frederic.

- 1898 Goodwin, Rev. Francis,

Hartford, Conn.

- 1898 Greene, Jacob L., Hartford.

- 1859 Havemeyer, John C.

- 1868 Huntington, Daniel.

- 1869 Hadden, John A.

- 1872 Holbrook, Levi.

- 1874 Hinton, John H., M.D.

- 1874 Huntington, C. P.

- 1878 Hitchcock, Hiram.

- 1883 Hebert, Henry B.

- 1883 Hurry, Edmund Abdy.

- 1883 Hoyt, Alfred M.

- 1888 Hoyt, Henry R.

- 1889 Huntington, Charles P.

- 1889 Hurtt, Frank D.

- 1889 Hitchcock, Welcome G.

Date of Election.

- 1892 *Hyde, Clarence M.*
 1895 *Hutchinson, Charles Hare.*
 1897 *Hearn, Geo. A.*
 1898 *Hubbard, Robert J.*
 1898 *Hearn, Arthur H.*
 1856 *Hewitt, Hon. Abram S.*
 1868 *Hall, Elial F.*
 1871 *Hand, Clifford A.*
 1874 *Haines, John P.*
 1874 *Hendricks, Edmund.*
 1874 *Hoyt, Harlow M.*
 1876 *Holt, Henry.*
 1876 *Hoes, Wm. M.*
 1878 *Hinman, Wm. K.*
 1879 *Hamilton, Wm. G.*
 1881 *Hinman, Russell.*
 1882 *Hascall, Theodore F.*
 1882 *Higginson, James J.*
 1883 *Hyde, E. Francis.*
 1885 *Hubbard, Walter, Meriden, Ct.*
 1886 *Hoe, Robert.*
 1886 *Henderson, Harold G.*
 1886 *Hoffman, Rev. Eugene A., D.D.*
 1886 *Hitchcock, Bradford W.*
 1886 *Hillhouse, Thomas G.*
 1887 *Hinchman, Walter.*
 1887 *Hastings, Prof. Thomas S., D.D.*
 1887 *Hague, James D.*
 1887 *Hunker, Lieut. J. J., U. S. N.*
 1887 *Hayes, Richard Somers.*
 1887 *Hill, James J.*
 1887 *Hoadley, Hon. George.*
 1888 *Hard, Anson W.*
 1888 *Hathaway, Horatio,*
 New Bedford, Mass.
 1888 *Hayward, James W.*
 1888 *Harbeck, Chas. T., Islip, N. Y.*
 1889 *Haynes, Prof. Henry W., Boston.*
 1889 *Hastings, W., Wilmington, Del.*
 1889 *Harper, Orlando M.*
 1889 *Hallidie, A. S., San Francisco.*
 1889 *Hayward, John H.*
 1889 *Harrower, H. D.*
 1889 *Howells, Henry C.*
 1889 *Henley, Wm. I.*
 1890 *Hill, James K., St. Paul, Minn.*
 1890 *Husted, Seymour L., Jr.*
 1891 *Henderson, Joseph J.,*
 Kingsbridge, N. Y.
 1891 *Haas, Kalman.*

Date of Election.

- 1891 *Herrman, A.*
 1891 *Hazard, Fred'k R., Syracuse.*
 1893 *Holden, E. F., Syracuse.*
 1893 *Hurlbut, Theo. D.*
 1893 *Hitchcock, Henry, St. Louis.*
 1893 *Holls, Fred'k Wm.*
 1893 *Huntington, Archer M.*
 1894 *Hoyt, Eugene F., M.D.*
 1894 *Haven, J. Woodward.*
 1894 *Hildreth, J. Homer.*
 1895 *Hoyt, Dr. Ezra P.*
 1896 *Hartley, Henry, M.D.*
 1896 *Hotchkiss, Miss C. W.*
 1896 *Hoppin, Hamilton L.*
 1897 *Hagerman, G. E.*
 1897 *Hoppin, Samuel Howland.*
 1897 *Heike, C. R.*
 1897 *Hudson, John E., Boston.*
 1897 *Hendricks, Clifford B.*
 1897 *Humphreys, Alex. C.*
 1897 *Hart, Walter T., Rye, N. Y.*
 1897 *Hoe, Wm. A.*
 1897 *Heinsheimer, L. A.*
 1897 *Huyler, John S.*
 1897 *Hochschild, Berthold.*
 1897 *Hetzel, John J.*
 1897 *Hyde, Dr. Fredk. E.*
 1897 *Hoey, Rev. Jos. L.*
 1898 *Hodgson, Richard, LL.D., Boston.*
 1898 *Hoppin, Prof. James M., D.D.,*
 New Haven.
 1898 *Howell, Maxwell D.*
 1898 *Hoffman, J. W., Orangeburg, S. C.*
 1881 *Ives, Brayton.*
 1887 *Isham, Charles.*
 1887 *Ivison, David B.*
 1859 *Ireland, John B.*
 1874 *Iselin, Adrian, Jr.*
 1890 *Irving, Walter.*
 1874 *Jesup, Morris K.*
 1880 *Jewett, George L.*
 1886 *Jackson, Rev. Samuel M.*
 1888 *Jones, Oliver L.*
 1871 *Jones, Walter R. T.*
 1874 *Jenkins, Wm. L.*
 1874 *James, D. Willis.*
 1874 *Jaffray, Robert.*
 1879 *Jay, William.*

Date of Election.

- 1881 Johnson, Bradish.
 1885 Juilliard, A. D.
 1886 Janeway, Henry L.,
 New Brunswick, N. J.
 1886 Jacobi, A., M. D.
 1887 Jenkins, Augustus S.
 1890 James, Walter B., M. D.
 1890 Johnes, Edward R.
 1890 Janin, Henry.
 1891 Jaques, W. H.,
 South Bethlehem, Pa.
 1891 Jones, Washington, Philadelphia.
 1891 Jaffray, Robt., Jr.
 1893 Johnson, Reverdy, Baltimore.
 1893 Jenkins, Michael, Baltimore.
 1893 Julien, Alexis A.
 1894 James, Arthur Curtiss.
 1895 Jennings, Oliver G.
 1895 James, Charles F.
 1897 Jameson, Prof. Joseph M.
 1897 James, Edward C.
 1897 Jackson, Theodore F.
 1897 Judson, Rev. Edward.

 1873 Kennan, George, Washington, D. C.
 1874 Kingsland, William M.
 1876 Knauth, Percival.
 1877 King, Clarence.
 1878 Kernochan, Jas. Lorillard.
 1880 Keene, James R.
 1881 Kennedy, John S.
 1881 Kane, Grenville.
 1882 King, George Gordon,
 Newport, R. I.
 1885 Keppler, Rudolph.
 1886 Kidder, Camillus G.
 1887 Knight, George T.
 1888 Kelly, Edward.
 1889 Kimball, F. J., Philadelphia, Pa.
 1893 Kane, Henry Brevoort.
 1895 Kean, Hamilton F.
 1898 King, Hon. John A.
 1874 King, Edward.
 1874 Keck, Thomas.
 1879 Kane, S. Nicholson.
 1881 Kirsch, Louis.
 1883 Kerr, Walter.
 1883 King, D. H., Jr.
 1886 Kendall, Edward H.
 1887 Kevan, William.

Date of Election.

- 1888 Kissel, Gustav E.
 1888 Kellogg, Charles, Athens, Pa.
 1888 Kennedy, H. Van Rensselaer.
 1889 Kauffmann, S. H.,
 Washington, D. C.
 1890 Kempton, C. W.,
 Oro Blanco, Arizona.
 1891 Kissel, Rudolph H.
 1892 King, John Hurtin.
 1897 King, Morris Lee, M. D.
 1897 Kemmerer, M. S.,
 Mauch Chunk, Pa.
 1897 Kimball, Alfred R.
 1897 Kohn, S. H.
 1897 Keene, Roswell W.
 1897 Kelso, G. Radford.
 1897 Keiley, John D.
 1898 Kohn, Harry D.

 1859 Lathers, Richard.
 1869 Lawrence, John S.
 1870 Loew, Hon. Frederick W.
 1874 Lorillard, Pierre.
 1875 Low, Hon. Seth.
 1876 Low, A. Augustus.
 1878 Loubat, J. F., LL.D.
 1881 Libbey, Prof. William,
 Princeton, N. J.
 1881 Langdon, Woodbury G.
 1881 Little, Hon. Joseph J.
 1886 Ludington, C. H.
 1888 Lynch, James D.
 1890 Loth, Joseph.
 1891 Lansing, Abraham, Albany, N. Y.
 1896 Lewis, Clarence McK.
 1897 Livingston, Goodhue.
 1870 Lyman, Edward H. R.
 1878 Leon, Néstor Ponce de.
 1882 Langdon, Woodbury.
 1882 Lapham, Lewis H.
 1883 Lounsbery, R. P.
 1886 Leete, C. H.
 1887 Logan, Walter S.
 1887 Lovell, John W.
 1889 Lewis, Richard V.
 1889 Lovell, Frank H.
 1889 Lydig, David.
 1889 Lowthian, Thos., Denver, Colo.
 1890 Lamberton, Chas. L.
 1891 Levine, Julius.

Date of Election.

- 1891 Loewy, Benno.
 1891 Leavitt, E. D.,
 Cambridgeport, Mass.
 1891 Lewis, Enoch, Philadelphia.
 1892 Lawrence, E. A.
 1893 Learned, Hon. Wm. L., Albany.
 1895 Landon, Francis G.
 1895 Le Boutillier, Thos.
 1897 Long, Thos. J.
 1897 Lawrence, Cyrus J.
 1897 Larrabee, Jesse.
 1897 Lobenstine, Wm. C.
 1897 Lachman, Samson.
 1897 Livermore, Frank, M.D.
 1898 Lowenstein, B.
 1898 Lamberton, James M.,
 Concord, N. H.
 1898 Lincoln, Solomon, Boston.
 1898 Lockwood, Homer N.
 1898 Ladd, Rev. Horatio Oliver.

 1859 *Morrell, William H.*
 1859 *Moore, Frank.*
 1863 *Moore, W. H. H.*
 1864 *Morton, Hon. Levi P.*
 1868 *Marquand, Henry G.*
 1872 *Marié, Peter.*
 1874 *Morris, Henry L.*
 1874 *Morgan, J. Pierpont.*
 1874 *Merrall, William J.*
 1875 *Martin, Bradley.*
 1878 *Musgrave, Thomas B.*
 1878 *Mason, Lieut. T. B. M., U.S.N.*
 1880 *Mills, D. O.*
 1882 *Markoe, F. H., M.D.*
 1883 *Mackay, Donald.*
 1883 *McCreery, James.*
 1884 *Moore, Joseph, Jr.,*
 Philadelphia, Pa.
 1884 *MacKellar, William.*
 1885 *Morison, George S., Chicago, Ill.*
 1887 *Morgan, William Fellows.*
 1888 *Marquand, Henry.*
 1888 *Mason, Alexander T.*
 1888 *Martin, Oswald J.,*
 Whitehouse, N. J.
 1888 *McGee, James.*
 1889 *Maitland, Alexander.*
 1892 *Mills, A. G.*
 1895 *McCord, Wm. H.*

Date of Election.

- 1868 Morrison, Henry.
 1872 Meyer, F. William.
 1874 Marble, Manton.
 1874 Moir, James.
 1874 McAlpin, David H.
 1875 Mitchell, Edward.
 1875 Marcus, Arnold.
 1875 McLanahan, Geo. William.
 1876 Mitchell, W. Howard.
 1879 Miller, John Bleeker.
 1882 Marquand, John P.
 1883 Morgan, E. D.
 1883 Mali, Charles.
 1885 Mackenzie, D. E.
 1886 Moore, John G.
 1886 Moses, Raphael J., Jr.
 1887 Malcolm, William L.
 1887 Mack, Jacob W.
 1887 Mali, Henry W. T.
 1887 McCready, N. L.
 1888 Morgan, Rev. D. Parker.
 1888 Moss, Mrs. J. Osborne, Sandusky, O.
 1888 Myers, Theodore W.
 1888 Moore, Cary W.
 1888 McKeever, J. Lawrence.
 1889 Martin, Robt. C.
 1889 McCormick, Hon. R. C.
 1889 Milliken, James.
 1889 Macdonough, James.
 1889 Morgan, Wm. H.
 1889 Marié, Léon.
 1890 Mallory, S. H., Chariton, Iowa.
 1890 Mackey, Chas. W., Franklin, Pa.
 1890 Montant, Alphonse.
 1890 McCarter, Hon. Thos. N.,
 Newark, N. J.
 1890 Mackay, J. W.
 1891 Meeks, Edwin B.
 1892 Miller, Hon. Warner.
 1893 Moss, H. O., New Berlin, N. Y.
 1895 McMillin, Emerson.
 1895 Marcus, Geo. E.
 1896 MacCoun, Townsend.
 1897 McKeen, James.
 1897 Marc, Theophilus M.
 1897 Merrill, Wm. F.
 1897 Morris, Robt. T., M.D.
 1897 Metz, H. L., M.D.
 1897 McDonald, John E.
 1897 Marshall, Louis.

Date of Election.

1897 Muller, Edward M.
 1897 Miller, Geo. C.
 1897 Murray, David.
 1897 Millar, Geo. W.
 1897 Mills, T. M. P., Lakewood, N. J.
 1898 Marston, Edwin S.
 1898 McAlan, John.
 1898 Magerhans, Adolph W.
 1898 Miller, Chas. H., M.D.

1886 Neftel, W. B., M.D.
 1897 Newell, F. H., Washington, D. C.
 1874 Niles, William W.
 1880 Nelson, William.
 1886 Notman, John.
 1889 Nun, R. J., M.D., Savannah, Ga.
 1889 Newton, Daniel H.,
 Holyoke, Mass.

1891 Newkirk, Chas.
 1891 Newman, Mrs. Angeline E.,
 Omaha, Neb.

1892 Nichols, O. F.
 1893 Nelson, E. B., Rome, N. Y.
 1895 Nason, Carleton W.
 1896 Nelson, Frank G.
 1897 Nevers, Geo. G.
 1897 Notman, George.
 1897 Nichols, Geo. L.
 1897 Nixon, Lewis.

1874 Ottendorfer, Oswald.
 1875 O'Connor, Thomas H.
 1875 Opdyke, William S.
 1879 O'Brien, Thomas S.
 1880 O'Shaughnessy, John W.
 1887 Ogden, William B.
 1888 Oakes, T. F.
 1895 Owen, Miss Luella A.,
 St. Joseph, Mo.

1874 Olyphant, Robert M.
 1875 Ottiwell, John D.
 1879 O'Gorman, Richard.
 1881 Oakley, Henry A.
 1882 Oppenheim, Edward L.
 1889 Orr, Alexander E.
 1893 Operti, Albert.
 1896 Owen, James.
 1897 Ohman, August R.
 1897 Oppenheimer, Sol.
 1897 Owen, Mrs. Thos. Jefferson.

Date of Election.

1898 Obermeyer, Joseph.
 1852 Poor, Henry V.
 1872 Parish, Henry.
 1882 Parsons, William.
 1882 Parrish, James C.
 1882 Parsons, Mrs. E.
 1884 Plush, Dr. Samuel M.,
 Philadelphia, Pa.
 1885 Post, William Henry,
 Ogdensburg, N. Y.

1885 Planten, J. R.,
 Consul for the Netherlands.
 1886 Phoenix, Phillips.
 1887 Phoenix, Lloyd.
 1889 Pickering, Prof. E. C.,
 Cambridge, Mass.

1890 Plumb, Edward L.
 1891 Porter, Henry Kirke,
 Pittsburg, Pa.

1893 Pierce, Moses, Norwich, Conn.
 1893 Platt, J. D., Dayton, Ohio.
 1897 Paton, Wm. Agnew.
 1897 Parsons, George.
 1871 Peabody, Hon. Chas. A.
 1874 Peabody, Arthur J.
 1874 Penfold, William Hall.
 1874 Pondir, John.
 1875 Prentice, W. P.
 1875 Porter, Gen. Horace.
 1876 Plum, James R.
 1880 Pinchot, James W.
 1880 Powell, Wilson M.
 1881 Post, Charles A.
 1882 Pell, Wm. Cruger,
 Highland Falls, N. Y.

1882 Platt, Hon. Thos. C.
 1882 Parsons, John E.
 1882 Parsons, Charles.
 1884 Post, George B.
 1886 Pearsall, T. W.
 1886 Pryer, Chas., New Rochelle, N. Y.
 1886 Parris, Edward L.
 1887 Perdicaris, Ion, Tangier, Morocco.
 1887 Parsons, Wm. H.
 1887 Peters, Samuel T.
 1888 Perry, William A.
 1888 Paine, Robert Treat, Boston, Mass.
 1888 Phillips, Wm. D.
 1889 Palmer, S. S.

Date of Election.

- 1889 Peck, Charles E.
 1889 Putnam, Geo. L.
 1890 Perkins, W. H.
 1890 Potter, Edward Clarkson.
 1890 Palmer, Dr. H. R.
 1890 Poor, Henry W.
 1891 Powel, De Veaux.
 1891 Pinkus, Fred'k S.
 1891 Peters, Ed. M.
 1891 Pott, James.
 1893 Pinchot, Gifford.
 1893 Pluygers, Henry.
 1894 Pyne, M. Taylor.
 1894 Perry, John G., M.D.
 1895 Pickhardt, Carl.
 1895 Phyfe, James W.
 1895 Pease, Walter A.
 1897 Pray, Joseph M.
 1897 Parsons, Wm. Decatur.
 1897 Putnam, Samuel.
 1897 Palmer, N. F.
 1897 Prudden, Prof. T. Mitchell.
 1897 Prentiss, George Lewis.
 1897 Porter, Wm. H.
 1897 Parsons, Robt. W.
 1898 Potter, Frederick.
 1898 Preston, Howard W.,
 Providence, R. I.
 1898 Phillips, John S.
 1883 Quinlin, Leonard G.
 1898 Quincey, Mary Perkins.
 1868 *Raven, Anton A.*
 1872 *Robbins, Chandler.*
 1874 *Richard, Auguste.*
 1874 *Reynes, Jaime.*
 1874 *Russell, Archibald D.*
 1880 *Robb, Hon. John A.*
 1883 *Rowland, Thomas F.*
 1886 *Raymond, R. W.*
 1886 *Rice, Isaac L.*
 1887 *Robb, Hon. J. Hampden.*
 1887 *Rowell, George P.*
 1887 *Rogers, Archibald,*
 Hyde Park, N. Y.
 1889 *Roelker, Alfred.*
 1889 *Reed, J. Van D.*
 1868 *Rose, Cornelius.*
 1874 *Reid, Hon. Whitelaw.*

Date of Election.

- 1874 Riker, William J.
 1874 Rhoades, John Harsen.
 1876 Ross, William B.
 1878 Rainey, Thomas, M.D.
 1881 Rhinelander, Frederick W.
 1882 Robbins, S. Howland.
 1882 Rhinelander, Charles E.
 1882 Rathborne, C. L.
 1888 Rhinelander, Wm.
 1888 Renwick, Edward S.
 1888 Richter, Dr. C. M.,
 San Francisco, Cal.
 1888 Russell, Hon. John E.,
 Leicester, Mass.
 1888 Robinson, Wm. M.
 1889 Ropes, John C., Boston, Mass.
 1889 Rice, Prof. J. M., Northboro, Mass.
 1889 Robert, Fred'k.
 1889 Roberts, Rev. Wm. C., D.D.,
 Lake Forest, Ill.
 1889 Ryan, Thos. F.
 1890 Roe, Gen. Chas. F.
 1890 Raymond, Chas. H.
 1890 Roosevelt, Robt. B.
 1891 Robbins, Miss Harriet L.
 1892 Ryman, Wm. Penn,
 Wilkesbarre, Pa.
 1895 Reilly, Thos. A.
 1895 Rouse, Henry C.
 1895 Robbins, Rowland A.
 1896 Roncière, St. Croix de la,
 Point-à-Pitre, Guadeloupe.
 1897 Reinhart, Joseph W.
 1897 Rubino, Jacob.
 1897 Rusch, Henry A.
 1897 Rothschild, Frank, Jr.
 1897 Richardson, Clifford.
 1898 Reynolds, J. B.
 1898 Rexford, W. M., Montclair, N. J.
 1856 *Schermerhorn, William C.*
 1870 *Schafer, Samuel M.*
 1870 *Schafer, Simon.*
 1872 *Stuyvesant, Rutherford.*
 1873 *Scott, Julian, Plainfield, N. J.*
 1873 *Southworth, Alvan S.*
 1873 *Sturgis, Frank K.*
 1874 *Schermerhorn, F. Augustus.*
 1874 *Strong, Hon. W. L.*

Date of Election.

- 1875 *Sandford, Elliott.*
 1875 *Schiff, Jacob H.*
 1876 *Sibley, Hiram W., Rochester, N. Y.*
 1878 *Sands, William R.,*
New Hamburg-on-Hudson, N. Y.
 1879 *Stevens, Frederick W.*
 1879 *Smith, E. Reuel.*
 1880 *Southwick, Henry K.*
 1882 *Schuyler, Spencer D.*
 1882 *Sayre, Lewis A., M.D.*
 1883 *Sinclair, John.*
 1883 *Smith, Henry N., Trenton, N. J.*
 1886 *Sherman, George.*
 1887 *Sletson, George W.*
 1888 *Salisbury, Stephen, Worcester, Mass.*
 1888 *Stott, Frank H., Stottville, N. Y.*
 1888 *Schultze, John S.*
 1888 *Sherman, Chas. A.*
 1890 *Smith, Sir Donald A.,*
Montreal, Canada.
 1891 *Suckley, Robert B.*
 1893 *Sexton, Edward Bailey.*
 1897 *Shardlow, Joseph.*
 1898 *Schieffelin, Geo. R.*
 1856 *Spofford, Paul N.*
 1856 *Sherman, W. Watts.*
 1871 *Shaler, Gen. Alexander,*
Ridgefield, N. J.
 1872 *Steiger, E.*
 1873 *Sturges, Frederick.*
 1873 *Spencer, James C.*
 1874 *Sloan, Samuel.*
 1874 *Stuyvesant, Robert R.*
 1874 *Sands, Andrew H.*
 1875 *Smith, Lewis Bayard.*
 1875 *Sturges, Henry C.*
 1875 *Stewart, Col. Charles Seaforth,*
Cooperstown, N. Y.
 1876 *Stryker, Gen. William S.,*
Trenton, N. J.
 1877 *Schuyler, Philip.*
 1878 *Stewart, William Rhinelander.*
 1878 *Smith, S. Newton.*
 1879 *Smith, Herbert H.*
 1879 *Shields, Prof. Chas. W.,*
Princeton, N. J.
 1879 *Stetson, Francis Lynde.*
 1883 *Stone, Sumner R.*
 1883 *Spence, Lewis H.*
 1883 *Smith, William Alex.*

Date of Election.

- 1883 *Stern, Louis.*
 1883 *Scott, Rufus L.*
 1883 *Sorzano, Julio F.*
 1884 *Stokes, James.*
 1885 *Schmelzel, Wm. R.*
 1886 *Sherman, Prof. O. T.,*
Boston, Mass.
 1886 *Satterlee, F. Le Roy, M.D.*
 1886 *Sturgis, F. R., M.D.*
 1887 *Stewart, Lisenard.*
 1887 *Sutton, Rev. J. Ford, D.D.*
 1887 *Schell, Robert.*
 1887 *Seligman, Dewitt J.*
 1887 *Smith, Jas. Rufus.*
 1887 *Smith, Nathaniel S.*
 1887 *Sellew, T. G.*
 1887 *Sterry, George E.*
 1887 *Shortall, John G., Chicago, Ill.*
 1887 *Stevens, George T., M.D.*
 1888 *Stephens, Benjamin.*
 1888 *Smith, A. Cary.*
 1888 *Smythe, Rev. Hugh.*
 1888 *Sheldon, Edwin B.*
 1889 *Smith, Philip Sherwood,*
Buffalo, N. Y.
 1889 *Squibb, E. R.*
 1889 *Steinbrügge, E.*
 1889 *Steel, W. G., Portland, Oregon.*
 1889 *Sackett, Henry W.*
 1889 *Straus, Isidor.*
 1890 *Schwarzmann, A.*
 1890 *Sewell, Hon. Wm. J., Camden, N. J.*
 1890 *Snow, Elbridge G.*
 1890 *Simonson, Wm. H.*
 1890 *Schell, Francis.*
 1890 *Schernikow, Ernest.*
 1891 *Stanton, John.*
 1891 *Stieglitz, Edward.*
 1892 *Stokes, I. N. Phelps.*
 1892 *Sherman, Byron, Morristown, N. J.*
 1892 *Starr, Theodore B.*
 1893 *Shaw, Chas. A.*
 1893 *Smith, D. Cady, Schenectady.*
 1893 *Smith, Benj. E.*
 1893 *Swayne, Frank B., Toledo, O.*
 1893 *Stevens, C. Albert.*
 1895 *Sanford, Robert.*
 1895 *Stevenson, Richard W.*
 1895 *Shaw, W. M.*
 1895 *Sands, Robert C.*

Date of Election.

- 1895 Seebeck, Nicholas F.
- 1895 Stone, Col. Mason A.
- 1895 Sorchan, Victor.
- 1895 Squires, Grant.
- 1895 Scudder, Moses L.
- 1895 Smith, W. Wheeler.
- 1897 Standish, Myles.
- 1897 Stoiber, Louis.
- 1897 Sheehy, W. H.
- 1897 Stine, Marcus.
- 1897 Salomon, Sidney Hendricks.
- 1897 Schaus, Hermann.
- 1897 Shethar, Edwin H.
- 1897 See, Horace.
- 1897 Stotesbury, Louis W.
- 1898 Stevenson, Hall E.,

Garden City, N. Y.

- 1898 Salomon, Wm.
- 1898 Sheldon, Chas. H.
- 1898 Seward, Gen. Wm. H.,
- Auburn, N. Y.
- 1898 Schouler, James, LL.D., Boston.
- 1898 Simpson, Wm. T.

- 1856 *Tiffany, Chas. L.*
- 1876 *Terry, Rev. Roderick.*
- 1877 *Talcott, James.*
- 1882 *Tailer, Edward N.*
- 1882 *Terry, John T.*
- 1887 *Thompson, Frederic F.*
- 1891 *Tobey, Gerard C., Wareham, Mass.*
- 1893 *Tichenor, Francis M.,*

Newark, N. J.

- 1856 Townsend, Randolph W.
- 1868 Taylor, Douglas.
- 1872 Tower, Gen. Z. B., U. S. A.
- 1874 Taylor, Alfred J.
- 1875 Taintor, Charles M.
- 1875 Toel, William.
- 1877 Tillinghast, Wm. H.
- 1879 Turnbull, Robert J.,

Morristown, N. J.

- 1883 Thalmann, Ernest.
- 1884 Turner, J. Spencer.
- 1885 Tone, T. Wolfe.
- 1885 Tiffany, Rev. C. C., D.D.
- 1885 Turnure, Lawrence.
- 1886 Thorne, Jonathan.
- 1887 Ten Eyck, Sandford R.
- 1888 Tresidder, John R.

Date of Election.

- 1888 Taylor, C. Fayette, M.D.
- 1889 Tefft, F. Griswold.
- 1889 Tatham, Chas.
- 1889 Trask, Chas. H.
- 1890 Turner, Elisha, Torrington, Conn.
- 1890 Thorp, John R.
- 1890 Thorne, Samuel.
- 1891 Thaw, Benjamin, Pittsburg, Pa.
- 1891 Toop, George H.
- 1891 Taber, Chas.
- 1891 Townsend, Jas. B.
- 1893 Truesdell, Warren N., Newark, N. J.
- 1895 Taylor, George.
- 1895 Thomas, Allen M., M.D.
- 1896 Tilton, Edward L.
- 1897 Thomas, Geo. C.
- 1897 Travis, John C.
- 1897 Tonnelé, Walter.
- 1897 Tanner, Frederic A.
- 1897 Treacy, Richard S.
- 1898 Thompson, D. W.
- 1898 Thompson, Walter, Garrison, N. Y.

- 1888 *Uhl, Edward.*
- 1897 *Underhill, Eugene.*
- 1891 *Ulmann, Ludwig.*
- 1891 *Ullmann, Emanuel S.*
- 1895 *Underhill, Francis M.*
- 1897 *Untermeyer, Maurice.*
- 1898 *Untermeyer, Samuel.*
- 1898 *Upham, J. Baxter, M.D.*

- 1870 *Van Brunt, Hon. Charles H.*
- 1875 *von Post, H. C.*
- 1877 *Vanderbilt, Cornelius.*
- 1878 *Vanderbilt, William K.*
- 1887 *Van Alen, J. J., Newport, R. I.*
- 1887 *Van Slyck, George W.*
- 1889 *Vanderbilt, George W.*
- 1891 *Van Winkle, Edgar B.*
- 1854 *Viele, Gen. Egbert L.*
- 1875 *Van Buren, John D.*
- 1876 *Van Hoesen, Hon. Geo. M.*
- 1885 *Valentine, Henry C.*
- 1887 *Verastegui, Alberto, Havana, Cuba*
- 1888 *Villard, Henry.*
- 1888 *Ver Planck, Wm. G.*
- 1889 *Van Devanter, Willis,*
- Cheyenne, Wyoming.
- 1890 *Valentine, Ferdinand C., M.D.*

Date of Election.

- 1890 Vose, Geo. H.
 1893 Van Antwerp, J. H., Albany.
 1895 Vanderpoel, Waldron B., M.D.
 1897 Van Antwerp, William C.
 1897 Van Sloaten, William.
 1870 *Wilson, Gen. James Grant.*
 1872 *Wetmore, William Boerum.*
 1873 *Wiener, Joseph, M.D.*
 1874 *Wetmore, Hon. George P.*
 1878 *Whitehead, Henry M.*
 1879 *Watson, Francis A.*
 1882 *Waddingham, Wilson.*
 1882 *Williams, David.*
 1884 *Watson, George H.*
 1886 *White, Hon. S. V.*
 1887 *White, Julian Leroy,*
Baltimore, Md.
 1888 *Woodward, James T.*
 1890 *Williams, Norman, Chicago, Ill.*
 1890 *Wadsworth, Herbert, Avon, N. Y.*
 1892 *Wilson, J. B.*
 1895 *Willets, Robert R.*
 1898 *Wadsworth, Wm. Austin,*
Geneseo, N. Y.
 1898 *Watkinson, George, Philadelphia.*
 1854 Webb, William H.
 1868 White, Alexander M.
 1870 Ward, T. W.
 1875 Winslow, Gen. Edward F.
 1876 Wedemeyer, A. J. D., Liberty, N. Y.
 1881 Wilson, John.
 1884 Wood, Wm. H. S.
 1886 Wright, Wm. Phillips.
 1886 Wiman, Erastus.
 1886 White, Horace.
 1887 White, William Aug.
 1887 White, Alfred T.
 1887 Wilson, J. Wall.
 1887 Wheelock, George G., M.D.

Date of Election.

- 1887 White, Henry, London, Eng.
 1887 Westcott, Clarence L.
 1887 Welling, W. Brenton.
 1888 West, Hon. George,
Ballston Spa, N. Y.
 1888 Witherbee, Frank S.
 1888 Wynkoop, G. H., M.D.
 1888 Wetmore, Edmund.
 1888 Winslow, Dan.
 1889 Waterbury, John I.
 1890 Weir, Chas. G.
 1890 Wells, Edward, Jr.
 1891 Wolcott, Henry Roger, Denver, Colo.
 1891 Whitney, Hon. Milton B.,
Westfield, Mass.
 1891 White, Miss Georgiana.
 1893 Wills, Chas. T.
 1895 Wells, Charles W.
 1895 Winston, Frederick J.
 1895 Warren, Wm. R.
 1895 Washburne, A. L.
 1895 Woodford, M. D.
 1897 Wenman, James F.
 1897 Westover, M. F., Schenectady.
 1897 Wolff, Emil.
 1898 Whitfield, R. P.
 1898 Walker, Wm. Augustus.
 1898 Woods, John A.
 1898 Wait, Wm. B.
 1898 Wales, C. M.
 1898 Wolfe, J. Burke.
 1898 Wilkins, Hartwell A.
 1898 Warner, Chas. Dudley, Hartford.
 1891 Young, Edward L.
 1895 Young, Richard N.
 1898 Young, Reginald.
 1884 *Zabriskie, Andrew C.*

FELLOWS DECEASED.

- | | |
|--|--|
| Dana, Charles A., Oct. 17, 1897. | Grinnell, Robert M., Apr. (—), 1898. |
| Prichard, William M., Oct. 17, 1897. | Hoagland, C. N., Apr. 24, 1898. |
| Howell, Theodore D., Oct. 18, 1897. | Wendell, Jacob, May 21, 1898. |
| Holbrook, Edmund F., Nov. 6, 1897. | Taylor, Franklin E., June 30, 1898. |
| Hurlbut, Henry A., Nov. 11, 1897. | Ammen, Rear Adm. Daniel, U. S. N.,
July 11, 1898. |
| Hubbard, Gardiner G., Dec. 11, 1897. | Gade, Henry, July 27, 1898. |
| Taber, Henry M., Dec. 24, 1897. | Roosevelt, Clinton, Aug. 8, 1898. |
| Greene, John W., M.D., Dec. 27, 1897. | Hazard, Rowland, Aug. 16, 1898. |
| Harden, Hon. Wm. D., Jan. 11, 1898. | Rolston, Roswell G., Aug. 25, 1898. |
| Bagley, Mrs. Frances N., Feb. 7, 1898. | White, Andrew Judson, Sept. 23, 1898. |
| Steward, D. Jackson, Feb. 8, 1898. | Vanderpoel, A. Ernest, Sept. 26, 1898. |
| Jewett, Hugh J., Mar. 6, 1898. | Gillis, Charles J., Sept. 30, 1898. |
| Beckman, Wm. B., Mar. 8, 1898. | Clendenin, J. W., Oct. 15, 1898. |
| Haydock, George G., Apr. 6, 1898. | |
| Bradley, Leonard A., Apr. 18, 1898. | |

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1898.

No. 5

PHYSICAL GEOGRAPHY OF NEW YORK STATE.

BY

RALPH S. TARR.

PART V.—THE RIVERS OF NEW YORK.*

PREGLACIAL DRAINAGE.—In the present state of our knowledge it is quite impossible to tell much about the preglacial condition of New York drainage. As was stated in a previous article of this series,† there is reason for believing that in immediate preglacial times there were few, if any, lakes within the boundaries of the State. Another fact of the preglacial drainage is that before the ice came there were streams where the present large valleys now stand. In other words, the larger features of hill and valley are preglacial in origin.

At present it is difficult to go much further back in time than this. The history of the development of the preglacial drainage lines has evidently been long and complex. Born near the close of the Palæozoic, during the Appalachian uplift, there have been abundant changes in the drainage lines. From the history of this uplift one may well believe that the main original drainage of the State was northward and westward. As a result of the Appalachian uplift, and of the extension of this northward into Canada, combined with the mountain uplifts of earlier times in New England and the Adirondacks, there existed a range of highland in the east, extending from Canada to the Southern States, which must early

* For a general account of the drainage of New York, see Henry, Trans. Albany Inst., I, 1830, 87-112; Ballou, Amer. Nat., 1880, XIV, 139-140.

† Tarr, Bull. Am. Geog. Soc., 1898, XXX, 185.

have prohibited extensive drainage eastward from any part of New York. Westward and northward from this line of uplift there stretched extensive plains, over which streams from the rising mountains must have extended themselves as the plain increased.



FIG. 1.—PHOTOGRAPH OF HOWELL'S RELIEF MAP OF NEW YORK, MODELLED FOR THE NEW YORK STATE MUSEUM.

From a drainage map of the eastern United States it is easily seen that this supposed original drainage, consequent upon the initial topography, is far different from the present. Through the

Mohawk and Hudson rivers a considerable part of New York now drains eastward and southward into the Atlantic; and through the Delaware and Susquehanna a very considerable area also drains eastward across the folded rocks of the uplifted Appalachians; but the remainder of the drainage extends either westward or northward, as most of it probably did extend at first.

If this view of the early drainage of the State is correct, it becomes of marked interest to discover how it happened that streams passing westward and northward have been so changed that the drainage now finds its way across folded mountains in an easterly direction. Unfortunately, the answer to this is not ready.

It is, however, a fact that for a long time during the Mesozoic and the early Cenozoic, the northeastern part of this country was subjected to long-continued denudation, at the end of which the surface was certainly reduced to the condition of a low, hilly country, even in the most mountainous sections. Some believe that it was reduced to the condition of a low, almost featureless, plain, a peneplain.* During this long denudation there was ample time for streams to slowly adjust themselves to conditions of rock structure and position, and to slowly change their courses in order to adapt themselves to the existing conditions. For instance, the west- and north-flowing streams then had a long course over a moderate grade, reaching the ocean only after passing either to the Arctic, or to the North Atlantic near the Gulf of St. Lawrence, or to that sea which was the ancestor of the present Gulf of Mexico. On the other hand, the streams that flowed eastward, on the eastern slope of the mountains, had a short, steep slope, partly due to the mountain uplift, which was still further increased in the early Mesozoic at the time of that subsidence of the land which permitted the Triassic ocean to encroach upon eastern New Jersey and the neighboring corner of New York. This lowered the land to the east, and must have given to the east-flowing Appalachian streams an additional slope.†

East-flowing streams, therefore, had in general a more favorable position for rapid extension of headwater conquest than the west- and north-flowing streams. As a result of this battle between the headwaters of the two opposing sets of rivers, the more favorably situated ones may well have encroached upon those less favorably situated, and slowly forced the divide westward, until streams on

* See statement of this in Article III of this series, *Bull. Amer. Geog. Soc.*, 1898, XXX, 55; and also Tarr, *Amer. Geol.*, 1898, XXI, 351-370.

† See Davis, *Nat. Geog. Mag.*, 1889, I, 195.

the Appalachian plateau were allowed to cross the Appalachians directly to the Atlantic.*

Succeeding the lowland condition of the northeastern section of the country, there came, during the Tertiary time, an uplift of the land which was greater in the north than in the south; and at that time the general surface of New York was raised until it stood at a level considerably higher than at present. The evidence of this uplift is complete and will be stated in a later article. It seems entirely within reason to think that one of the results of this uplift may have been a change in the course of some of the rivers; for it is evident that such an uplift will increase the energy of one set of streams and decrease the energy of the opposing set, so that headwater erosion, and the conquest of stream territory, is rendered more easy. This uplift would have worked in the favor of the south- and east-flowing streams, and it may in part account for some of the changes in the New York State drainage. As will be shown when discussing the Mohawk (page 399), still other changes have been brought about by the glacial invasion.

It should be understood clearly that this statement of the early drainage history stands for little more than a mere suggestion. It deals with changes which are so far in the past that the facts necessary to prove the conclusions are difficult to find, and perhaps even impossible to discover. Certainly, with the facts so far found, and the studies that have so far been made, little more light has been thrown upon the question of the early drainage history of New York than is contained in the general and rather vague hints just put forth.

Concerning the changes since the immediate preglacial time, we have less difficulty in determining the facts necessary to prove the history. Our difficulty here comes chiefly from the fact that little study has been given to the problems, though there is added difficulty from the fact that in many cases the old preglacial valleys are too deeply drift-filled to permit any certainty of conclusion.

In a number of cases, however, studies have been made with sufficient care to warrant certain conclusions concerning changes in the preglacial drainage; and it is evident that changes both of a small and large kind have been caused by the ice invasion. A few of these will be considered in some detail to serve as types. There are numerous other similar changes known, and undoubtedly a great many more will be discovered when the proper studies have been made. These type instances will be considered by examples selected

* See Davis, *Nat. Geog. Mag.*, 1889, I, 183-253.

first from western New York, then from central, and finally from eastern New York.

THE UPPER ALLEGHENY.—The glacier front stood for a long time in the southern part of Chautauqua and Cattaraugus counties, and while there built extensive moraines. Numerous oil borings in south-western New York, and the neighboring part of Pennsylvania, show that the drift deposits in the valleys are heavy. Some of these are in the nature of overwash plains and valley trains, but others are evidently lake deposits. North-flowing streams were ponded back by the ice dam and caused to overflow toward the south, forming lakes, the evidence of which may be seen in several of the valleys. From the filling of these valleys by glacial, stream and lake deposits, and from the cutting down of divides at the point of outflow, one may well expect to find some rivers actually reversed in their course, having originally flowed northward and now turned southward. With the long stand of ice front here, and with the evidence from deeply drift-filled valleys, such a result would normally be expected.

Another point suggesting a reversal of drainage is the nearness of the Erie-Allegheny divide to Lake Erie. From the breadth of the valleys occupied by the Great Lakes, it seems evident that in preglacial times there must have been good-sized streams in the valleys. Yet the present divide between the Erie-Allegheny drainage is so near Lake Erie that, in places, one may stand upon it in plain sight of the lake. While this is not an *impossible* condition of drainage, it is distinctly unlikely that the divide of the tributaries to a large stream shall be so near the main stream. That this is an unnatural condition caused by some change in stream course is further indicated by the fact that the present divide is situated among the lower hills, amidst broad valleys, while to the southward, in the Pennsylvania plateau, the land is much higher and the valleys distinctly narrower. The real preglacial divide between the north- and south-flowing streams in this section seems, then, to have been not where it now is, but in Pennsylvania considerably south of the New York boundary.

It is to Carll* that we owe the positive proof that this conclusion is correct. He has shown very clearly that the Allegheny valley narrows up near Thomson's Gap, decreasing in width, from its normal breadth of about a mile, to about a quarter of a mile. Moreover, he has shown that the borings through the drift, which were made

* Second Geol. Survey Pennsylvania, Rept. III, 1880, 330-366.

for oil, prove that, from this narrow gap northward, the real *rock floor* of the valley slopes northward instead of southward, as the drift-filled valley now slopes and the present stream flows. His conclusion therefore is, that the upper Allegheny, now tributary to the Ohio, was in preglacial times a north-flowing stream, passing into the river that occupied the basin of Lake Erie.

In searching for the preglacial valley that carried its waters northward, Carll was not able to prove the exact place of outflow so satisfactorily as he had the fact of reversal; but, after consider-

ing the several possible valleys, decided that the outflow was probably through the Cassadaga Valley into Lake Erie near Dunkirk.

Foshay* accepts this work of Carll and proposes the name Carll River for this ancient preglacial river. Chamberlin and Leverett† likewise accept Carll's conclusions, excepting for the preglacial Cassadaga course. They show that wells in the Connewango Valley passed through 284, 314, 330 feet of drift without reaching rock, showing a deeply drift-filled valley, the continuation of which



FIG. 2.—FOSHAY'S ATTEMPT AT A RECONSTRUCTION OF THE PREGLACIAL DRAINAGE OF WESTERN PENNSYLVANIA AND NEW YORK.

they placed further east than the Cassadaga. Their conclusion is that the preglacial course of the Upper Allegheny was into Lake Erie through the Cattaraugus Creek, which enters the lake near the town of Silver Creek (Figs. 3 and 4).

Foshay‡ shows that this is not the only important change in the direction of the tributaries of the Ohio. Following the suggestion of Spencer§ he studied the region of the Beaver River and has shown that the Lower Allegheny, the Monongahela and the Upper Ohio rivers united at the Beaver River and together entered Lake Erie through the Grand River. For this preglacial stream, now broken

* Amer. Journ. Sci., 1890, XL, Ser. III, 397-403.

† Amer. Journ. Sci., 1894, XLVII, Ser. III, 247-283.

‡ Amer. Journ. Sci., 1890, XL, Ser. III, 397-403.

§ Amer. Phil. Soc. 1881, XIX, 300-337.

up into several parts, Foshay has proposed the name Spencer River (Fig. 2). As will be seen by the map (Fig. 4), Chamberlin and Leverett accept his conclusions in the main. It is evident that other similar reversals have occurred farther west in Ohio, so that if the Erie Basin could have its preglacial drainage, instead of being entered, as at present, by only a number of small streams, it would have several quite large tributaries, while the Ohio would be correspondingly reduced by the reversal of the tributaries which were given it as a result of the glacial invasion.

THE "GULFS" OF WESTERN NEW YORK.—One of the striking topographic features of the Erie escarpment of Western New York, in Chautauqua County, is the presence of numerous narrow gorges, locally called "gulfs," which breach the face of the escarpment. The small streams, flowing from the uplands of the Chautauqua County plateau, have carved steep-sided gorges in the soft Devonian shales. These are young postglacial valleys, having their origin in the fact that the drift deposits have partially, and in some cases almost completely, obliterated the preglacial valleys by filling. In some places these preglacial valleys are indicated as sags in the hillsides, occupied by streams, and sometimes by streams which have not yet cut down to the bed rock. In such cases the postglacial valleys are rather broad



FIG. 3.—PRESENT DRAINAGE OF UPPER OHIO WITH LAKE BEACHES AND MORAINES INDICATED (CHAMBERLIN AND LEVERETT).

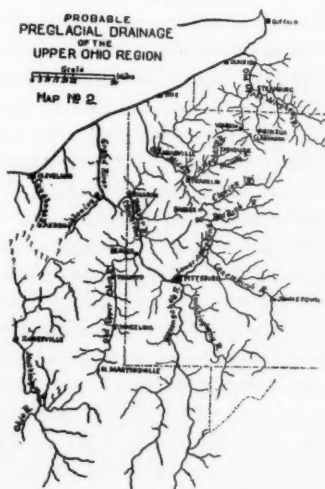


FIG. 4.—RECONSTRUCTION OF PREGLACIAL DRAINAGE OF UPPER OHIO REGION (CHAMBERLIN AND LEVERETT).

gorges carved solely in the glacial accumulations. Elsewhere the streams flow entirely outside of the preglacial valleys, and then they have carved rock gorges, frequently with waterfalls. Not uncommonly, however, the streams have their courses for the most part in preglacial valleys; but, owing to drift-filling of irregular form, they are often turned aside from the central axis of the valley, so that, after cutting through the drift, they find themselves at times superimposed upon the bed rock at one side of the valley. In such cases the "gulfs" are narrow, rock-walled gorges in places, and broad, drift-walled gorges in others, where their course is more nearly in accord with the preglacial valley axis. The scenery thus produced is quite like the gorge scenery of central New York (p. 390), where the conditions, both as to local structure and cause, are quite similar.

DRIFT-FILLED VALLEYS ALONG THE LAKE SHORE.—Besides the partially obscured valleys on the face of escarpment, and the drift-filled valleys of the plateau, there are similar buried valleys along the shores of the lake. This is proved by the fact that the rock cliff along the shores of Lake Erie is here and there interrupted by stretches of drift without rock, notably at Dunkirk and Silver Creek. The bottoms of these valleys are below lake level, and in the case of the Cattaraugus Creek, which Chamberlin and Leverett believe to be the former course of the Upper Allegheny, the drift-filling is at least 95 feet below the present lake level. This was shown by a well boring at Versailles, seven miles from the lake, where the well did not reach rock at a depth of 95 feet below lake level. This tends to prove that preglacial Lake Erie Valley was lower than the present lake surface; and, together with similar facts elsewhere, this has an important bearing on the question of the preglacial history of the Great Lakes.

No attempt will be made to discuss the question of the Niagara River and the Great Lakes in this paper, though at this point we may refer to the fact that, in the course of the gorge-cutting by the present Niagara, a buried channel has been revealed at the whirlpool, and that this extends northward to the edge of the escarpment at St. David's. The exact meaning and history of this buried valley is not yet clearly understood, though there is some reason for supposing it to be the course of the Tonawanda Creek before the last invasion of the ice. It cannot properly be considered to be the preglacial course of the Niagara River, for whatever the preglacial drainage of the Great Lake area may have been,

there is no reason for thinking that the course of one of the streams of the system was along the line of the present Niagara River.

Nor does this buried gorge from the whirlpool to St. David's coincide exactly with our idea of a preglacial valley. During all the time that it had for development, such a valley should be broad, with somewhat rounded sides, having reached the form of early maturity; but this valley is a distinctly narrow, steep-sided gorge with youthful characteristics. It has been suggested that the buried gorge is really interglacial, formed possibly by the Tonawanda Creek during the interval between the first and second advance of the ice sheet.

It does not require a long nor a very detailed study of the drainage features of northern and western New York to see that this gorge condition of parts of valleys, now filled or partially obscured by drift, and hence antedating the last advance of the ice, is a feature that will have to be taken into full consideration before the studies of the drainage history are complete. Some cause has introduced gorges of earlier date than the drift-filling, and has introduced them in connection with distinctly preglacial valleys. What this cause is I am not yet prepared to state, though interglacial stream-cutting seems the best hypothesis in the present stage of the investigation. This question will be briefly considered again below (p. 395).

THE GENESEE RIVER.—Owing to the early settlement of Rochester, and the presence of the falls there, the lower part of this valley early attracted attention, and it was recognized that the lower gorge has been carved out by the action of running water.* The first description at all adequate was by Hall,† who states some of the more important facts in the history of the valley.

The Genesee is the only river which crosses the entire State, rising in Pennsylvania, just south of the boundary, and flowing northward into Lake Ontario, just to the north of Rochester. The valley presents some interesting peculiarities, for there are four quite distinct parts to it.‡ From the headwaters to Portageville (Fig. 5) the river flows in a broad, mature valley, evidently preglacial in age, and partly filled and broadened in the centre by

* See, for instance, Bigsby, *Amer. Jour. Sci.*, 1820, II, 250-54; Wadsworth, *Same*, 1830, XVIII, 209-210; Silliman, *Same*, 1830, XVIII, 210-211; Hall, *Geology of New York*, Fourth Dist., 1843, 377-382.

† *Geol. of New York*, Fourth Dist., 1843, 342-347; 368-374.

‡ Grabau, *Proc. Boston Soc. Nat. Hist.*, 1894, XXVI, 359-369.

hundred and fifty to two hundred feet deep. This valley seems altogether too large for so small a stream to make. While the direct connection between this and the upper Genesee has not been discovered, Grabau is of the opinion that the Oatka Creek really represents the continuation of the preglacial upper Genesee. Chamberlin* points out that there is much moraine and massive glacial deposits near Portageville, and suggests that the real channel

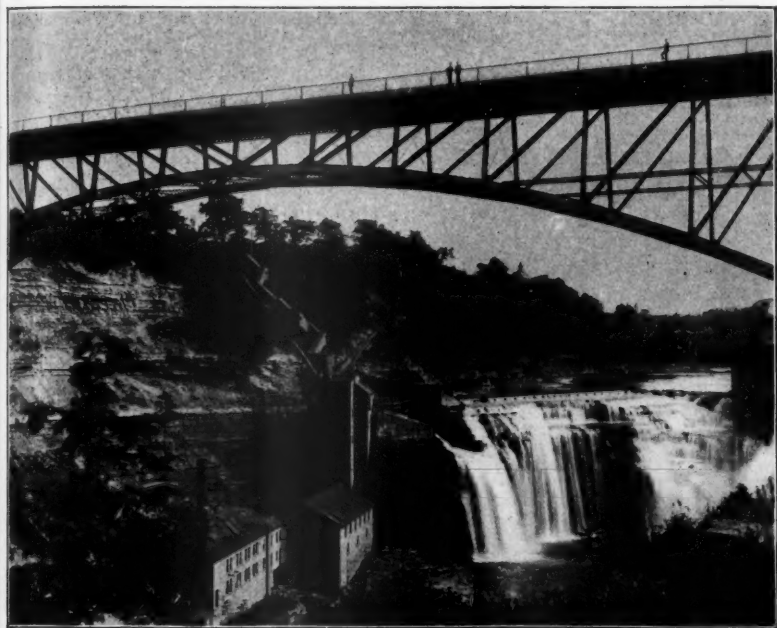


FIG. 6.—LOWER GENESSEE FALLS.

of preglacial Genesee lies to the east of the gorge course, instead of to the west, as Grabau has suggested.

To the east of the middle Genesee there is another broad preglacial valley, occupied by the Canaseraga Creek, which joins the Genesee just below the Portageville-Mt. Morris gorge. This valley appears to be the preglacial tributary of the middle portion of the Genesee. According to the views of Grabau, which have been stated more fully in his paper, the upper Genesee turned westward

*3d Annual Report, U. S. Geological Survey, 1883, 351.

into the Oatka Creek and joined the valley now occupied by the Genesee at some point below Avon. This river received the tributaries occupying the valley now the site of Canaseraga Creek and the middle preglacial portion of the Genesee. The exact place of union of these two streams has not been proved.

The postglacial gorge from Rochester to Lake Ontario represents a farther turning aside of the preglacial stream, which forced it to cut into the rock. To the east of Rochester there is a broad valley extending from the lake to Penfield. At the north it is fully a mile wide, where it forms a bay called Irondequoit Bay, which is partially shut off from the lake by a sand-bar. This valley is at least 250 feet deep. The suggestion naturally arises that the Irondequoit Bay represents the preglacial course of the lower Genesee, and this suggestion was actually made by Hall as long ago as 1843.* It has since been restated by Dryer†; and Grabau‡ thinks that it was at least the former outlet of the preglacial Canaseraga, and, if the Genesee united with this, of the Genesee also. There are extensive drift deposits near Rochester consisting of moraines, kames and drumlins, so that the ancient valley may well be entirely obscured by these deposits.

There are probably other changes in the Genesee valley, especially about the headwaters, as there are further east in the Finger Lake region (p. 389); but no work has been done upon this region. With reference to the changes recorded above, it may be stated that, while some points are as yet uncertain, it seems that the two gorges call for some such changes as those outlined; and, while the conclusions of Grabau may be somewhat modified in detail by future studies, the main fact, that the present Genesee follows a course which is different from the preglacial course in the two gorge portions, may be considered proved, and the suggested course extremely probable.

THE CHEMUNG VALLEY.—So far as I can find, no one has studied the conditions in the upper Susquehanna and its tributaries. Having worked to some extent in this valley, I have seen that there are problems of importance connected with the changes in river course. It is not improbable that some of this drainage found its way northward through the valley of Seneca Lake; but the evidence of this is not yet complete enough for a discussion of the subject.

* Hall, *Geol. of New York*, Fourth Dist., 1843, 344, 422.

† *Amer. Geol.*, V, 1890, 202-207.

‡ *Proc. Boston Soc. Nat. Hist.*, XXVI, 1894, 364.

Nevertheless it should be pointed out that at Havana, four miles south of the lake, a well in the middle of the valley passed through



FIG. 7.—ELMIRA SHEET SHOWING ABANDONED PREGLACIAL VALLEY (U. S. GEOL. SURVEY, TOPOGRAPHIC MAP).

435 feet of drift without reaching rock,* and that six miles south of this a well 186 feet deep did not reach rock. From this it is seen

* Lincoln, Amer. Journ. Sci., 1894, XLVII, Ser. III, 109.

that the valley is deeply drift-filled, being occupied by a heavy deposit of moraine. It is also a broad valley and may possibly represent the course of a north-flowing preglacial stream, receiving tributaries from south of the present divide. In any event, it is certain that the present divide is determined by drift deposits, not by the bed-rock outline, as it was in preglacial times, and therefore that its present position is not the exact preglacial one.

One notable change of glacial origin is illustrated on the Elmira sheet of the U. S. Geological Survey (Fig. 7). It will be seen that the Chemung, flowing from the west in a broad valley with flat bottom, abruptly leaves it, passing through a very narrow valley behind a large and high hill, and emerges again into the old broad valley at Elmira. In doing this, it makes a shorter cut from near Big Flats to Elmira; but while this is true, it is noticeable that the stream leaves what was evidently its preglacial course past Horseheads.* No rock is found in the stream bed, either in the broad main valley or in the narrow valley now occupied by the river. It is evident from this that the Chemung has not made a postglacial cut in passing from Big Flats to Elmira.

The conditions of the valley are these: A massive moraine occupies the upper or southern part of Seneca Valley as far as Pine Valley; and while the ice was standing there building this moraine, floods of sediment-laden water were poured into the Chemung, to which were added other contributions from the tributary streams to the west of this. These glacially furnished gravels form a notable part of the filling of the abandoned Chemung Valley.† The flat-bottomed valley is the product of the overburdened condition of glacially supplied water, and it forms a very typical overwash plain.

Prior to this flooding there had been two small tributaries to the Chemung heading on the southern side of the hill, in the narrow valley now occupied by the Chemung. From the map one will see where the preglacial divide was situated; for the valley behind the hill broadens both ways from this narrow divide section. The glacial floods choked these small tributaries with sediment until their bottoms were raised above the level of the divide between

* This valley has been studied by Mr. N. H. Farnham, of Cornell, who has written an undergraduate thesis upon the subject and deposited it in the Cornell Library. To Mr. Farnham I am indebted for some of the facts stated here. Space prohibits a full statement of all the evidence, which will be published in due time elsewhere.

† There are other deposits than these in the valley, notably till, partly, and in places completely, buried beneath the gravels.

them,* so that, when the sediment supply ceased, it was possible for the Chemung to pass behind this hill, being prevented from flowing through the old valley because of the slightly greater elevation there, caused, no doubt, by the fact that the sediment supply was greater from the Seneca Valley than from the others, thus causing a more rapid filling near Horseheads than in the more remote valley near Big Flats and along the present narrow course of the Chemung. The evidence of these changes is quite complete.

REVERSAL OF DRAINAGE NEAR LAKE CAYUTA (Fig. 8).—Doubtless there are hundreds of cases of changes in drainage in New York similar to these which have been discussed, though practically nothing has been published upon them. As further illustration of accidents to river courses, I propose to state some of the changes near Cayuta Lake which have been carefully studied. These will serve as illustrations of types rather than because of their intrinsic importance.

Extending from Cayuta Lake southwest to the Seneca Valley is a broad valley choked with extensive morainic deposits. It is a direct continuation of the Cayuta Lake valley (see U. S. topographic map, Ithaca sheet), and yet the outflow of the lake is not through this broad valley, but southeast, passing through a narrow gorge cut in the hills.* If the water went as one would expect from the general topography, and as it evidently did in preglacial times, it would have entered Seneca Lake and thence have passed northward, provided the stream occupying this valley flowed as the water now runs. Instead of this it now passes southward into the Atlantic through the Susquehanna.



FIG. 8.—TO SHOW PRESENT AND PREGLACIAL STREAM COURSES NEAR CAYUTA LAKE.

*This appears to be an interglacial cut. See p. 395.

There are other changes near here. By examining the Ithaca sheet of the U. S. Geological Survey* it will be noticed that a series of hills stretch across the valley of Pony Hollow at the place which is now the divide. These hills are a part of the terminal moraine, and their height has prevented the postglacial streams in that vicinity from taking their preglacial course. The real preglacial divide of the Pony Hollow stream is near Newfield on one branch, and near Trumbull's Corners on the other. By the filling of the Pony Hollow valley this stream has lost fully half of its volume. This amount of water has been turned from the Seneca Valley into the Cayuga. In addition to the moraine filling in Pony Hollow valley, there are also extensive deposits of overwash material, which have transformed the valley bottom to a broad overwash plain.

Cayuta Lake and the Pony Hollow stream, in preglacial times larger than now, at present unite to form Cayuta Creek, which flows southward to the Susquehanna. The map shows the valley narrowing in the direction of flow of these streams until Cayuta Creek reaches a narrow gorge, south of which the valley again broadens. The topographic evidence here, therefore, points to another case of reversal, the site of the gorge being a divide similar to that of Thomson's Gap in the Upper Allegheny. Other topographic evidence points toward the westward flow of this part of Cayuta Creek, with its tributaries from the Pony Hollow stream and Cayuta Valley, all of which flowed westward into the Seneca stream through a broad valley now deeply drift-filled and occupied by only one or two very tiny streams. Evidence of these changes is only less complete than that of the Allegheny by the absence of borings to show that the conclusions from topography are verified by rock bottom slope.

GORGES OF THE FINGER LAKES REGION.†—In Central New York there are many postglacial gorges cut in the Devonian shales, and in them are a great number of picturesque waterfalls. In each case they represent a new stream course caused by diversion resulting from drift deposits. While each case presents peculiarities of its own, I shall select only a few near Ithaca to serve as types of the others, among the most noted of which are Watkins and Havana Glens at the head of Seneca Lake. The region about Ithaca, as also that

* Figure 15, opposite page 50, Bull. Amer. Geog. Soc. XXX, 1898.

† Hall, Geol. of New York, 4th Dist., 1843, 377-382; Macfarlane, Science, IV, 1884, 99-101; Lincoln, N. Y. State Museum Rept., XLVIII, Part 2, 1894, 67-68.

about Seneca Lake, and the head of the other Finger Lakes, is one of heavy drift deposits, connected with the moraine of the "second glacial epoch".* The ice passed rather freely along the axis of these north-south valleys and partially scoured them out; but the tributaries from east and west, instead of being deepened, were shallowed by drift deposit,† especially near the lake valley. Consequently, when the streams began to flow after the ice had withdrawn, they were often obliged to seek new courses because their old valleys were so deeply drift-filled. This was the cause for the gorges, and the waterfalls have developed during the process of gorge-cutting.

In the case of Six Mile Creek, which enters the Cayuga valley from the east at Ithaca, the postglacial stream occupies the preglacial valley throughout its distance; but, because of the drift-filling, it is not now flowing at all places along the *lowest* part of the old valley. So, as in the case of some of the "gulfs" of Chautauqua County, this creek has in places cut through

the drift to find itself superimposed upon the rock wall of a part of the old valley. Where this is the case, we have a rock-walled gorge, often with falls and rapids, while in the other parts the valley is broad and drift-walled, forming what are locally known as "amphitheatres." In passing up this valley one comes first into a gorge, then into a broad amphitheatre, and again into another gorge, etc. Each gorge represents a place where the postglacial stream has



FIG. 9.—GREEN TREE FALLS IN A POSTGLACIAL GORGE SECTION OF SIX MILE CREEK (J. O. MARTIN, PHOTOGRAPHER).

* Tarr, Bull. Amer. Geog. Soc., XXX, 1898, 196.

† Tarr, Bull. Amer. Geog. Soc., XXX, 1898, 215-216.

cut into the rock banks of the preglacial valley; and each amphitheatre a place where the present stream flows near the centre of the preglacial valley, so that it has not yet reached the old rock floor.

Buttermilk Creek, south of this, occupies its preglacial course down to the distance of about a mile from the Cayuga valley, where it leaves it and cuts a rock gorge, while the preglacial valley is trace-



FIG. 10.—TAUGHANNOCK FALLS AND GORGE.

able just north of the gorge, where it is seen in the form of a broad valley filled with drift. The conditions at Fall Creek are similar to Buttermilk, the old valley being here also to the north of the postglacial gorge; and the same is true of Taughannock gorge, in which is found the highest fall in the State, where the water falls vertically for a distance of 215 feet. Here the old valley is also north of the postglacial gorge. Coy Glen, southwest of Ithaca, presents similar conditions, but here the preglacial valley is *south* of the postglacial.

In all these cases the old valley is abandoned by the stream at a distance of one or two miles from the lake valley. There

are reasons for this, one being that the preglacial valleys are more completely obliterated by drift-filling near the lake than on the high land farther back from it. Another is that, as the ice went down the Cayuga valley, glacial erosion scoured not only the bottom but the sides, thus lowering the tributary valley walls so that less filling was necessary to obliterate them. The third reason for the abandonment of the preglacial valley is the lake deposits; and this is the most important, especially in determining the exact course of the

lower or gorge part of the streams. This calls for a fuller statement than the others.

When the ice was leaving it the Cayuga Lake valley was occupied by a lake, dammed back by the glacier,* and the evidence of this is found in the form of remarkably well developed deltas opposite the stream mouths. These deltas completed the filling of the preglacial valleys in places, so that, when the lake had disappeared, the new river courses, down the hillside into Cayuga Lake, were determined by the position that the streams happened to then have upon the deltas which

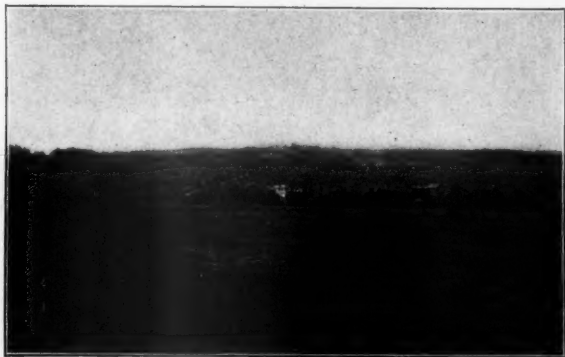


FIG. II.—LOOKING INTO DRIFT-FILLED VALLEY OF PREGLACIAL (INTER-GLACIAL?) TAUGHANNOCK.

were just being abandoned. Each stream naturally began cutting a gorge at the very place where it was flowing at the time the lake disappeared, and this accounts for the very remarkable condition at Taughannock Falls, where the new course has been begun on the hillside instead of in the lower ground of the partially filled preglacial valley. The first place where the stream leaves its preglacial valley is, therefore, at the site of the uppermost delta; and, as the lake dropped by successive stages, indicated by successively lower deltas, the course was locally redetermined by the lower deltas during the process of lake withdrawal.

The presence of the new gorges on the *south* side of the old valleys, which is the prevailing condition, is due to the effect of the north winds on the extinct lake, which forced the deltas, and therefore the river courses, to the southward. The reason why this is not so in the case of Coy Glen is that its situation is protected from the north winds, but exposed to those from the south. What is said of

* Fairchild, *Bull. Geol. Soc. Amer.*, 1895, VI, 353-374.

these specific cases will apply in general to many of the other gorges of the Finger Lakes.

In the gorges are many remarkable waterfalls. Of these there

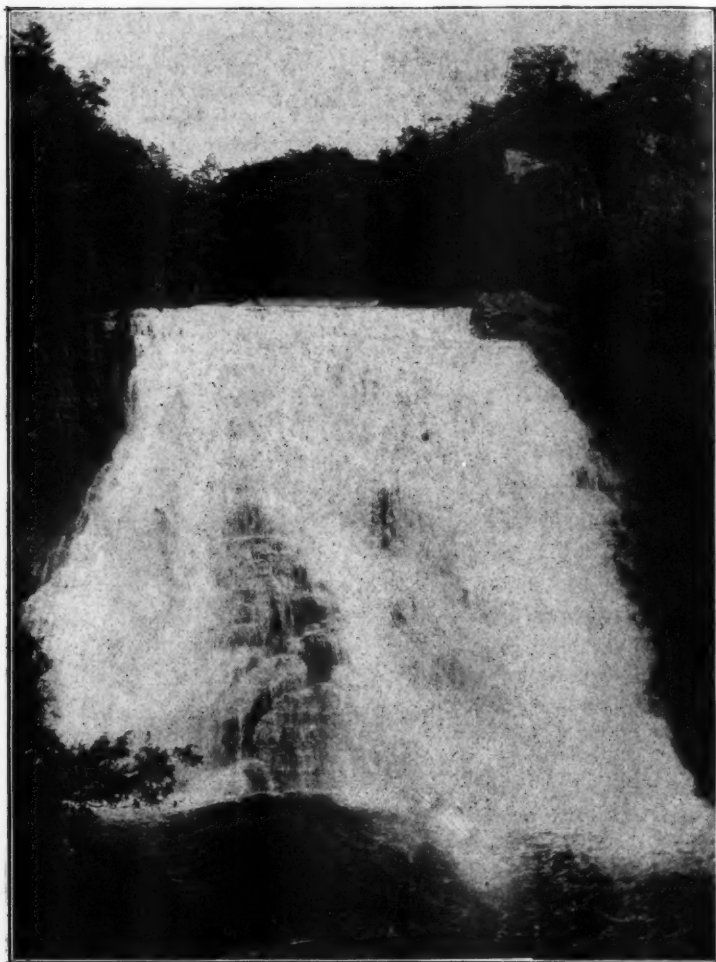


FIG. 12.—ITHACA FALLS AT THE OUTLET OF FALL CREEK GORGE NEAR THE CORNELL CAMPUS.

are two main types: one represented by Taughannock (Fig. 10), where the fall is straight down, and the other by the Ithaca Falls (Fig. 12), where the falls consist of a succession of steps. The

former is the Niagara type, and occurs where there is a hard layer to hold the fall at that level; the latter is found either where there is no unusually hard layer, or else where there are several hard strata near together with intermediate beds of soft rock.

These falls are in process of change, the Niagara type moving upstream, and maintaining their height at the level of the hard stratum, while the second type is becoming transformed to rapids (Fig. 13). In both cases they had their birth as a result of the accident which turned streams to one side of their old courses, and caused them to tumble down a steep hillside, in which they have undertaken the task of carving a valley, which has now reached this stage of development, varying slightly under different conditions, but in all cases being a gorge with rapids and falls.

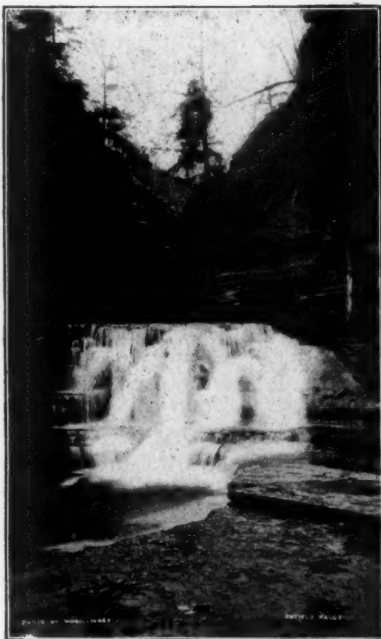


FIG. 13.—STEP FALL OVER SEVERAL HARD LAYERS, ENFIELD GORGE (MCGILLIVRAY, PHOTOGRAPHER).

INTERGLACIAL (?) GORGES.—In central New York there are numerous gorges which are broader than the postglacial valleys and partially obscured by glacial till, showing that they were formed either during preglacial or interglacial times. This class of valley is especially well illustrated in Six Mile Creek, where its relation to the broad, mature preglacial valley is well shown (Fig. 15). In one case near Taughannock valley, lake beds containing fresh water fossils have been found beneath the till.

Space forbids a discussion of this subject, since the exact origin of these gorges is not yet determined. When studies have reached over a wide enough area, the question of their distribution and origin will be brought forward; but at this time only the fact of their existence is mentioned in the hope that it may reach the eyes of some

who are working on the physiography of the State where similar gorges



FIG. 14.—TRIPHAMMER FALLS IN FALL CREEK ON NORTHERN BOUNDARY OF CORNELL CAMPUS.

exist. The question is a large one, and not to be settled by the study of a single valley. One naturally thinks of these gorges as being interglacial in origin, and this explanation seems at present the most probable; but all that can now be said with certainty is, that they antedate the last advance of the ice. The question of these gorges has a very important bearing upon the whole subject of the drainage history of central and western New York.

FORMER CONDITION OF THE FINGER LAKE VALLEYS. — Much has

been written upon the origin of the Finger Lakes of New York.*

* Some of these refer to origin of Great Lakes. A complete bibliography of this subject will appear in a later number of this series. Vanuxem, *Geol. of New York*, 3rd Dist., 1842, 237; Hall, *Geol. of New York*, 4th Dist., 1843, 321, 405-6; Newberry, *Proc. Boston Soc. Nat. Hist.*, IX, 1862, 42-46; Same, *Annals New York Lyc. Nat. Hist.*, IX, 1870, 213-234; Same, II, 1874, 136-138; Same, *Geol. Survey of Ohio*, II, 1874, 72-80; Same, *Proc. Amer. Phil. Soc.*, XX, 1882-83, 91-95; Simonds, *Naturalist*, XI, 1877, 49-51; Same, *Amer. Geol.*, 1894, XIV, 58-62; Foote, *Notes upon geological history of Cayuga and Seneca Lakes*, Ithaca, N. Y., 1877, 14 pp. (Thesis presented for the degree of doctor of philosophy at Cornell University, June, 1877); Shaler & Davis, *Illustrations of the Earth's Surface*, Boston, 1881, p. 52; Davis, *Proc. Boston Soc. Nat. Hist.*, XXI, 1882, 359-361; Same, 1882-83, XXII, 19-58; Spencer, *Proc. Am. Phil. Soc.*, XIX, 1881, 300-337; Same, *Amer. Geol.*, 1894, XIV, 134; Johnson, *Annals New York Acad. Sci.*, II, 1882, 249-266; Chamberlin, 3rd Ann. Rept. U. S. Geol. Survey, 1883, 353-360; Wright, *The Ice Age in North America*, 3rd Ed., 1891, 323; Same, *Man and the Glacial Period*, 1892, 94; Lincoln, *Amer. Journ. Sci.*, XLIV, 1892, 290-301; Same, XLVII, 1894, 105-113; Same, *New York State Museum*, Rept. 48, Part 2, 1894, 60-125; Brigham, *Bull. Amer. Geog. Soc.* XXV, No. 2, 1893, 1-21; Tarr, *Bull. Geol. Soc. Amer.*, V, 1894, 339-356; Same, *Amer. Geol.*, 1894, XIV, 194.

There is uniformity of agreement that they represent preglacial valleys, and the later workers are agreed that they represent preglacial valleys in some of which, at least, the streams flowed northward. There is a further agreement that they have been transformed to lakes by glacial action, though there is no agreement as to the exact cause for this change. It seems certain that at least Cayuga, Seneca, and the larger valleys to the west of these, which now enter Lake Ontario through the Oswego, had a more direct course to the lakes in preglacial times. As early as 1843 Hall suggested* that, prior to the formation of the Cayuga marshes, the outflow of Lakes Cayuga and Seneca was into the Ontario valley, through Port Bay. North of the Finger Lakes there is a broad valley



FIG. 15.—CROSS-SECTION OF SIX MILE CREEK SHOWING PREGLACIAL, INTERGLACIAL (?) AND POSTGLACIAL VALLEYS.

transformed to a bay, which seems very likely to be the preglacial continuation of one or several of these valleys, though now choked with an extensive accumulation of drift, some of which is in the form of drumlins, through which the Seneca River now finds its way in a winding course. This region is so drift-filled in places that there is no surface sign of a preglacial valley.

With reference to the cause of the transformation of the north-south valleys to lakes there are two opposing explanations. One is that they are clogged with drift, the other that they are gouged out by ice erosion. In all probability the true explanation is a combination of these two. The erosion theory, as a partial explanation of the depth of these valleys, was proposed in 1892 by Lincoln† and for Lake Cayuga in 1894 by myself.‡ The conclusions stated in my earlier paper have stood the test of much more extended studies, so that, after four years, I am even more fully convinced that the two larger lakes owe their depth below the lake surface in large measure to ice erosion, and that they are in the nature of rock basins. Additional facts have been brought to light in support of this theory, and none opposed to it. The only modification of the original proposition is that coming from the study of the supposed interglacial gorges; and since these are not now fully

* Hall, *Geol. of New York*, 4th Dist., 1843, 415.

† Lincoln, *Amer. Journ. Sci.*, 1892, XLIV, 290-301.

‡ Tarr, *Bull. Geol. Soc. Amer.*, V, 1894, 339-356.

understood, it is impossible at present to state just what this modification will be.

Therefore, the explanation which I shall put forward for the Finger Lake valleys is that there existed here several north-flowing streams, occupying preglacial valleys, some of which united and entered the Ontario stream somewhere north of Lakes Cayuga and Seneca. Without doubt some of the smaller of these Finger Lakes have been formed almost, if not entirely, by glacial deposits; but the two largest have their origin only in part as the result of glacial dumping. They offered broad channel ways, along which the



FIG. 16.—VIEW OF THE LAKE CAYUGA VALLEY FROM THE CORNELL CAMPUS. A BROAD PREGLACIAL STREAM VALLEY BROADENED AND DEEPENED BY GLACIAL EROSION AND NOW OCCUPIED BY A LAKE.

ice stream moved much more easily than upon the neighboring irregular hilltops. Not only was the movement more rapid, but the depth of the ice was greater. The position of the rocks, dipping southward, and the nature of the friable shales, conspired toward rapid erosion; and so these north and south preglacial valleys were markedly deepened.

Evidence of this comes from the side streams. The rock bottoms of the preglacial valleys of these tributary streams are not now below the level of the lake water in the southern part of the valley. If all the drift could be removed, and the streams be allowed

to flow along the line of the course of the preglacial valleys, and enter the valley of Lake Cayuga as it now stands, excepting that it be robbed of water, they would tumble between three and four hundred feet in a distance of about a mile, commencing their sudden descent near the present lake margin, a most unnatural condition for mature tributaries near their mouths.

Another fact in support of this explanation, clearly seen since the paper referred to was published, is that, if the main Cayuga stream flowed at the level of the present lake bottom, some of the tributary streams, like Fall Creek, must now have a drift-filling of not less than a thousand feet at a distance of three miles from the lake, a depth of drift hardly to be expected, and greater than anything anywhere known.

THE MOHAWK RIVER.*—Very early, possibly as far back as the Palæozoic times, the Adirondack Mountain mass evidently stood as a highland area, shedding water in several directions, and perhaps radially in all directions, as it does now. Some of these streams, flowing northward and westward, entered the Laurentian River, whose course determined the location of the Ontario Valley.

Judging by the history of the region, it seems exceedingly improbable that the Mohawk then had the course which it now follows. There are various reasons for believing that this river has developed its present course only after a long and complex history. It stands now as a notable topographic feature, a trench in the land in places over fifteen hundred feet deep and from twelve to twenty miles wide.† And it offers some evidence of this history.

According to Brigham‡ the original Mohawk located itself on the southern side of the Adirondack Mountain mass, eating westward by headwater erosion as far as Little Falls. It was essentially a monoclinical valley, following the boundary between the Palæozoic and massive Archean rocks. Another river, flowing westward, and entering the Ontario Valley, called by Brigham the Rome River, disputed with the Mohawk for territory with its headwaters also at Little Falls.

The first evidence of this is found in the fact that the Mohawk narrows up to a gorge at Little Falls, somewhat as the Allegheny

* Vanuxem, *Geol. of New York*, 3rd Dist., 1842, 20-21, 203-211; Dana, *Amer. Journ. Sci.*, Ser. II, XXXV, 1863, 243-249; Darton, *State Museum Rept.* 47, 1894, 603-623; Same, *Rept.* 48, Part 2, 1895, 33-53; Same, *Geol. Survey New York*, 1896, 14th Annual Report, 33-56; and, particularly, Brigham, *Bull. Geol. Soc. Amer.*, IX, 1898, 183-210.

† Brigham, *Bull. Geol. Soc. Amer.*, IX, 1898, 183-210.

‡ *Bull. Geol. Soc. Amer.*, IX, 1898, 186.

does at Thomson's Gap (p. 379), while west of this gorge, the valley again broadens, indicating that Little Falls is a divide region. This was early suggested by Chamberlin* and has been confirmed by the careful studies of Brigham,† who points out that this divide was determined by faulting at Little Falls, as the result of which the more resistant rocks at this point had been brought up nearer the surface than elsewhere in the valley. The proof of this position, so clearly suggested by the topography, and which has occurred to many travellers in passing through the Mohawk on the railroad, is the same as that brought forward by Carll for the Upper Allegheny (p. 379), namely, well-borings proving that the rock valley bottom west of Little Falls slopes westward, although the stream itself is now flowing eastward upon drift deposits. The rock floor slopes from an elevation of 376 feet at Little Falls to 347 at Utica and 220 at Sylvan Beach at Oneida Lake. The drift-filling is frequently more than 150 feet.

The Little Falls divide was lowered somewhat by glacial erosion, and then by the glacial water at the time that the Great Lakes were forced to overflow through the Mohawk Valley. At this time, while the divide was being lowered by water action, the headwaters of the present Mohawk were being filled with sand and gravel, since they were occupied by lake waters with an overflow at Little Falls. The divide has been still further lowered by the postglacial cutting of the western stream added to the original preglacial Mohawk.

According to this interpretation, the proof of which seems complete, the falls and rapids of the Mohawk, which have been so important in determining the site of several towns and industries, have been caused first by the production of faults, probably at the time of the Appalachian uplift, which raised the harder underlying rocks, so that they might serve as a divide because of their greater power of resistance, and, secondly, by the influence of the glacier in combining two streams flowing in opposite directions into a single stream, the present Mohawk, causing the upper part to flow across the old divide. This glacial accident has had an important influence upon the entire history of New York State, for, by building up the present grade of the Mohawk, it made the project of the construction of the Erie Canal far more feasible and less expensive than it would have been had it been necessary to *rise over* the divide at Little Falls, instead of *passing down* a fairly uniform and moderate

* 3rd Ann. Rept. U. S. Geological Survey, 362.

† Bull. Geol. Soc. Amer., IX, 1898, 183-210.

slope, mostly over soft glacial and lacustrine, and possibly, in part, marine deposits.*

THE HUDSON RIVER.—The Hudson is divisible into two quite different parts: (1) the navigable section, from its mouth to Troy, which is in reality an estuary reached by tide water, and (2) the section from tide-water upstream, where it is a small but normal river, often interrupted by falls and rapids. In these respects the Hudson is like all the rivers that enter the ocean in the northeastern part of the continent, excepting that, in the case of the Hudson, the estuarine part is relatively longer and narrower than in the case of most such streams.

It takes but little study of this and other similar valleys to see that the upstream portion, above the tidal section, is the same in origin as the part occupied by the tide. They are in both cases valleys of erosion, and the occupation of a part of the valley by the tide water is due merely to the sinking of the land which has allowed the sea to enter the valley, as it would enter any land valley of the present if the land level should sink far enough. The valley has been partly drowned, and the river may be said to be a drowned river near its mouth. There is other evidence than that of the land topography that this is the true explanation.

When the Hudson River began its course is not certain. It now cuts across formations of different kinds, some of them representing the very roots of planed-down mountains, formed as far back as the Silurian time.† It is evident that the river did not originally have such a course as to have allowed it to cut across mountain chains. Professor Davis‡ believes that the Hudson valley lowland, on either side of the narrow trench now occupied by the river, was excavated during the Tertiary times, being begun upon a broad peneplain of Juratrias-Cretaceous origin, and hence having its course determined by the irregularities of this plain rather than by the attitude of the markedly folded rocks out of which the peneplain had been formed by long denudation.

An alternative view is that the broad valley which had been formed here in the course of time was then submerged beneath the sea, either in Triassic or Cretaceous times, and later being raised to form dry land was occupied by a river whose course was determined by the deposits made in the arm of the sea. Such a river course, which would

* Taylor, *Am. Geol.*, 1892, IX, 344; Upham, *Same*, 410.

† Tarr, *Bull. Amer. Geog. Soc.*, 1897, XXIX, 26-31.

‡ *Proc. Boston Soc. Nat. Hist.*, XXV, 1892, 318-335.

be said to be a superimposed course, would not necessarily be in accord with the attitude of the rocks, but might readily cross mount-

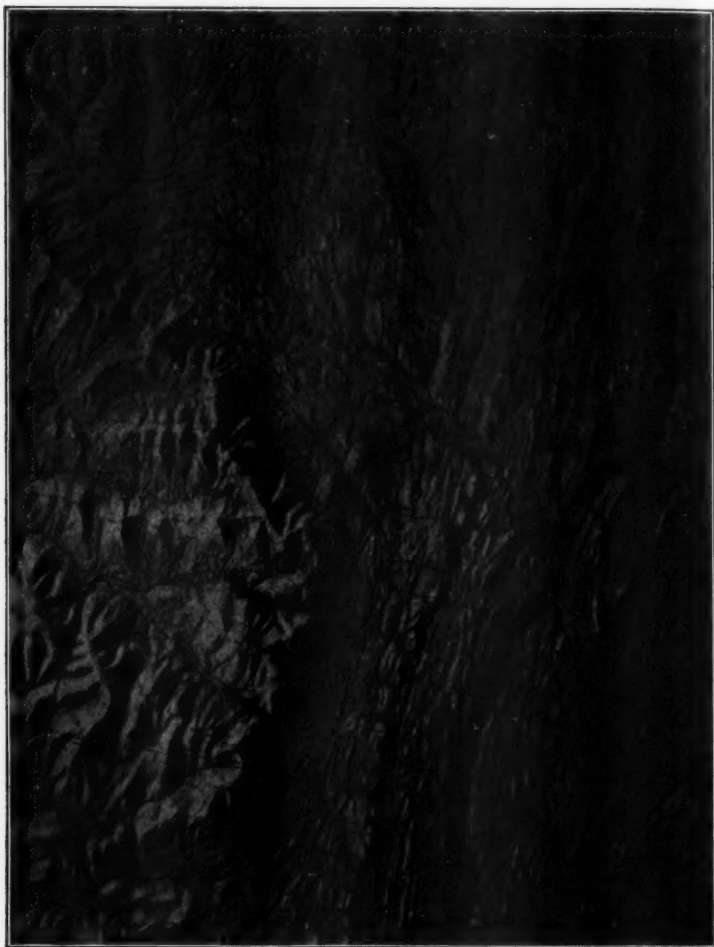


FIG. 17.—THE CATSKILLS AND MIDDLE HUDSON RIVER VALLEY SHOWING BREADTH OF VALLEY
(PHOTOGRAPH OF MODEL BY E. E. HOWELL, WASHINGTON, D. C.).

ain folds. No proof of either of these hypotheses has been brought forward, and they therefore can be offered merely as suggestions as to the possible cause for the location of the Hudson here; and it

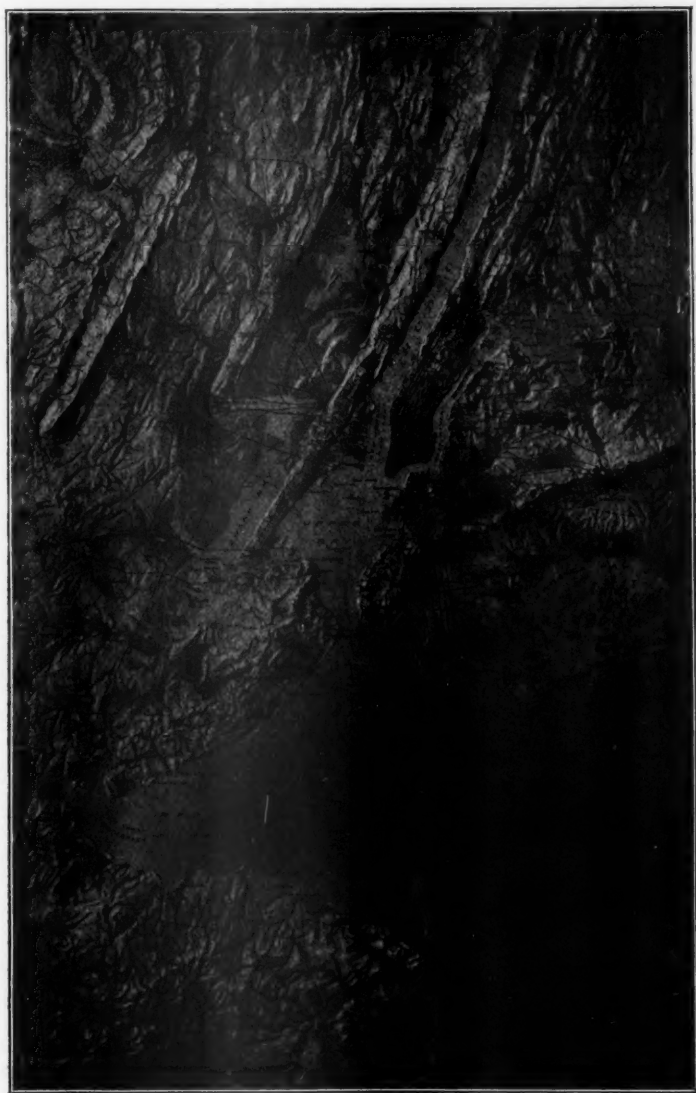


FIG. 18.—MODEL BY E. E. HOWELL OF LOWER HUDSON VALLEY AND NEW YORK BAY.

should be stated, furthermore, that these two suggestions do not exhaust the number of possible hypotheses.

Whatever the origin of this peculiar course, the Hudson seems to have begun the formation of the prominent features of its present valley in the Tertiary time, when the land was uplifted before the glacial period. Since this uplift was greater in the north than in the south, the valley was cut more deeply in the north; and where the rocks are soft, as above Newburgh, the valley is wide, while where they are harder it is narrow.* As a result of late Tertiary, or possibly post-Tertiary uplift and erosion, the river has cut a trench in this lowland a mile or more in width and of unknown depth. This trench, or gorge, is the valley of the Hudson which one sees in passing up the river; but to see its real relation to the broader valley one must leave the gorge and look across the valley from the high ground at one side, as for instance from the eastern slopes of the Catskills (Fig. 17). The Hudson valley is then seen to be a double valley, very broad and gently sloping, for the most part, and traversed by a narrow trench of unknown depth cut in the bottom of the broad valley lowland.

This inner, later gorge valley of the Hudson is of marked interest. It is up this that the tide waters extend; and therefore its bottom is now below sea-level. Since this gorge is the result of carving by river water, this fact proves that the river trench was cut at a time when the land was higher above sea-level than at present. This being so, one would expect to find a continuation of the valley beyond the present coast line along the sea-bottom plain of the continental shelf. As has been shown by Lindenkohl †, there is a channel extending to a distance of 105 miles from New York, having a width of a mile or two and a depth of 2,400 feet. It reaches to the very edge of the continental shelf, where it is indicated by a deep and rather narrow gorge. There are similar drowned river valleys off the New England coast, and near the mouth of the St. Lawrence, indicating a former general elevation of the north-eastern part of the continent.

* These statements are based upon Professor Davis' discussion of the valley, *Proc. Boston Soc. Nat. Hist.*, XXV, 1892, 318-335. See also Davis, *Bull. Geol. Soc. Amer.*, II, 1891, 570-571.

† United States Coast Survey, *Annual Rept. for 1884*, 435-438 (This channel is mentioned by Newberry, *Ann. New York Lyceum Nat. Hist.*, IX, 1870, p. 221, and also *Popular Sci. Monthly*, XIII, 1878, 641-666); Same, *Amer. Journ. Sci.*, 1885, Ser. III, XXIX, 475-480; Same, XLI, 1891, 489-499; Dana, *Amer. Journ. Sci.*, Ser. III, XL, 1890, 425-437; Upham, *Bull. Geol. Soc. Amer.*, I, 1890, 563-567; Same, *Proc. Amer. Assoc. Adv. Sci.*, XLI, 1892, 171-173.

During the time of the formation of this submerged valley, the Hudson must have received as tributaries some of the rivers of New Jersey and Connecticut which now enter the sea independently, and possibly the Connecticut itself. So the drowning of a portion of the land has dissected the stream system in its lower portion.

During the glacial period, the broad Hudson valley lowland was scoured by ice erosion, for it formed a trough down which the ice could easily move. Also, when the ice left the region, the land stood lower than at present, and the sea extended through the Hudson to the St. Lawrence, through the valley of Lake Champlain, thus making New England an island. The evidence of this is abundant and conclusive, for the valleys of the St. Lawrence, Lake Champlain, and the Hudson, contain clay deposits, often bearing marine fossils; and river deltas on the valley sides exist opposite the mouths of the streams.* The sea reached up the valley of the Mohawk, and some think that it passed even over the divide at Little Falls, as far as Lake Ontario, making the Adirondacks also an island. In some parts of the valley the deposits do not contain marine fossils; but this cannot be taken as evidence against marine origin, for the water may have been freshened by the addition of large quantities of ice-furnished water.

According to Merrill the depression was greater in the north than in the south, amounting to 340 feet near Albany, and about

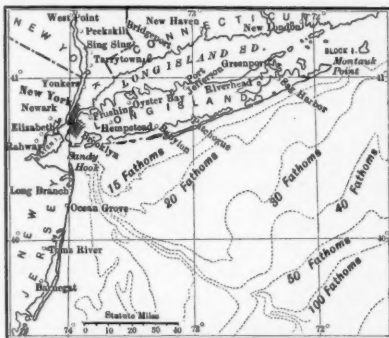


FIG. 10.—MAP OF SUBMERGED HUDSON RIVER VALLEY ON COASTAL SHELF OFF NEW YORK (AFTER DANA).

* Hale, Amer. Journ. Sci., 1821, III, 72-73; Finch, Same, X, 1826, 227-29; Mather, Geol. of New York, 1st Dist., 1843, 129-150; Emmons, Same, 2nd Dist., 1842, 422-427; Ramsay, Quart. Journ. Geol. Soc., XV, 1859, 211-212; Hitchcock, Geol. of Vermont, Vol. I, 1861, 152-191; Same, Proc. Amer. Assoc. Adv. Sci., 1870, XIX, 175-181; Dwight, Trans. Vassar Bros. Inst., III, 1884-5, 86-97; Merrill, Amer. Journ. Sci., XLI, Ser. III, 460-466; Davis, Proc. Boston Soc. Nat. Hist., XXV, 1891-92, 318-335; Ries, 10th Rept. New York Geological Survey, 1890, 110-155; Same, Trans. New York Acad. Sci., 1891, XI, 33-39; Turner, Bull. Phil. Soc. of Washington, XI, 1891, 385-410; Taylor, Amer. Geol., 1892, IX, 344; Upham, Same, 410; Darton, N. Y. State Museum Rept., 47, 1894, 453-455; Nason, Same, 459-468; Brigham, Bull. Geol. Soc. Amer., IX, 1898, 183-210.

80 feet near New York; and this conclusion is in harmony with the evidence from other sections of the country. The reasons for the difference in elevation of the beaches and deltas of the Hudson valley, as elsewhere on the continent, is that the postglacial uplift, which has raised the deposits above the sea, has been greater in the north than in the south.

OTHER RIVERS.—Little else has been written about the rivers of New York; but there are some points of interest in the articles mentioned below. Emmons* describes Glens Falls; and, in the same report, briefly discusses other rivers in his district, as do also Hall, Vanuxem and Mather in their reports on the geology of New York State. An interesting case of glacial diversion in the Bronx River is described by Kemp,† and some of the valleys of the Adirondacks are explained by Kemp.‡

As shown by Darton,§ the headwaters of the Kaaters Kill and Plaaters Kill in the Catskills are exceedingly peculiar. The tributaries enter in barbed fashion, pointing up stream, instead of down stream, as they should normally. It looks as if they were tributaries to a west-flowing stream, instead of east-flowing; and Darton's suggestion is that they originally did flow westward into a stream which the Kaaters Kill and Plaaters Kill have been beheading by headwater erosion. This river capture of headwaters may well be expected here, for the Kaaters Kill and Plaaters Kill have steep, short slopes to tide water, while the streams with which they are in combat have a longer and less steep slope. It is one of the best cases of headwater conquest so far presented.

Lewis|| points out that the short streams on the southern side of the Long Island moraine, where they flow over the overwash gravel plains, have steep banks on the western side and flow in a direction slightly south of west. A similar condition has been shown to exist elsewhere where rivers are flowing in shallow trenches in soft deposits, and the peculiarity has been explained by the deflective effect of the earth's rotation, which, in the northern hemisphere, tends to turn moving bodies to the right. Lewis applies his explanation to the courses of the Long Island streams, and

* Emmons, *Geol. of New York*, 2nd Dist., 1842, 188.

† *Trans. New York Acad. Sci.*, 1896, 18. See also Britton, *Trans. New York Acad. Sci.*, I, 1882, 181-183, and Brigham, *American Geologist*, XXI, 1898, 219-222.

‡ *Bull. Geol. Soc. Amer.*, 1892, VIII, 408-413.

§ *Bull. Geol. Soc. Amer.*, 1896, VII, 505-507; See also Julien, *Trans. New York Acad. Sci.*, I, 1881, 24-27.

|| *Amer. Journ. Sci.*, Ser. III, XIII, 1877, 215-216.

Gilbert,* after considering the question, accepts this explanation.

CAVERNS.—During the course of stream development, in a region of limestone rocks, some of the drainage, finding its way underground, dissolves the limestone, and carves underground channels, which in some cases become true underground streams, possibly miles in length. Nowhere in New York is the development of limestone beds sufficient for the formation of extensive underground courses; but there is some limestone, and in this, one would expect to find such drainage.

The caverns so formed are naturally superficial, for the flow of water in them is determined by the level of the outflow, which itself is governed by the surface streams. Naturally, then, some of the underground channels have been destroyed by erosion in the glaciated region. Others have no doubt had their inlets or places of outflow clogged with drift, so that they are not easily seen; and still others, as in any limestone region, have not yet been discovered. But a few such underground channels, such as Howe's Cave, have been found and are visited.† They are not highly ornamented by stalactites and stalagmites, and do not compare in importance with the caves in other regions of the United States, where limestone strata are extensively developed.

* Amer. Journ. Sci., 1884, Ser. III, XXVII, 427-432.

† See, for instance, Shepard, Amer. Journ. Sci., XXVII, 1835, 368-370; Gebhard, Same, XXVIII, 1835, 172-177; Mather, Geol. of New York, 1st Dist., 1843, 109-113, 637; Eggleston, Amer. Journ. Sci., Ser. II, I, 1846, 434-435.

EXPLORATION OF CENTRAL ALASKA.

No better evidence could be had of the stability of our Government than the calm indifference with which, during the past summer, all its functions were performed and the plans of its various departments executed in apparent obliviousness of the state of war then existing. While the attention of the public was concentrated on the all-absorbing progress of the war, other events were occurring which at another time would have attracted considerable attention. One of the most notable series of exploring expeditions undertaken within a generation by the United States was successfully commenced and concluded, and that in spite of the demands upon the Government created by the war.

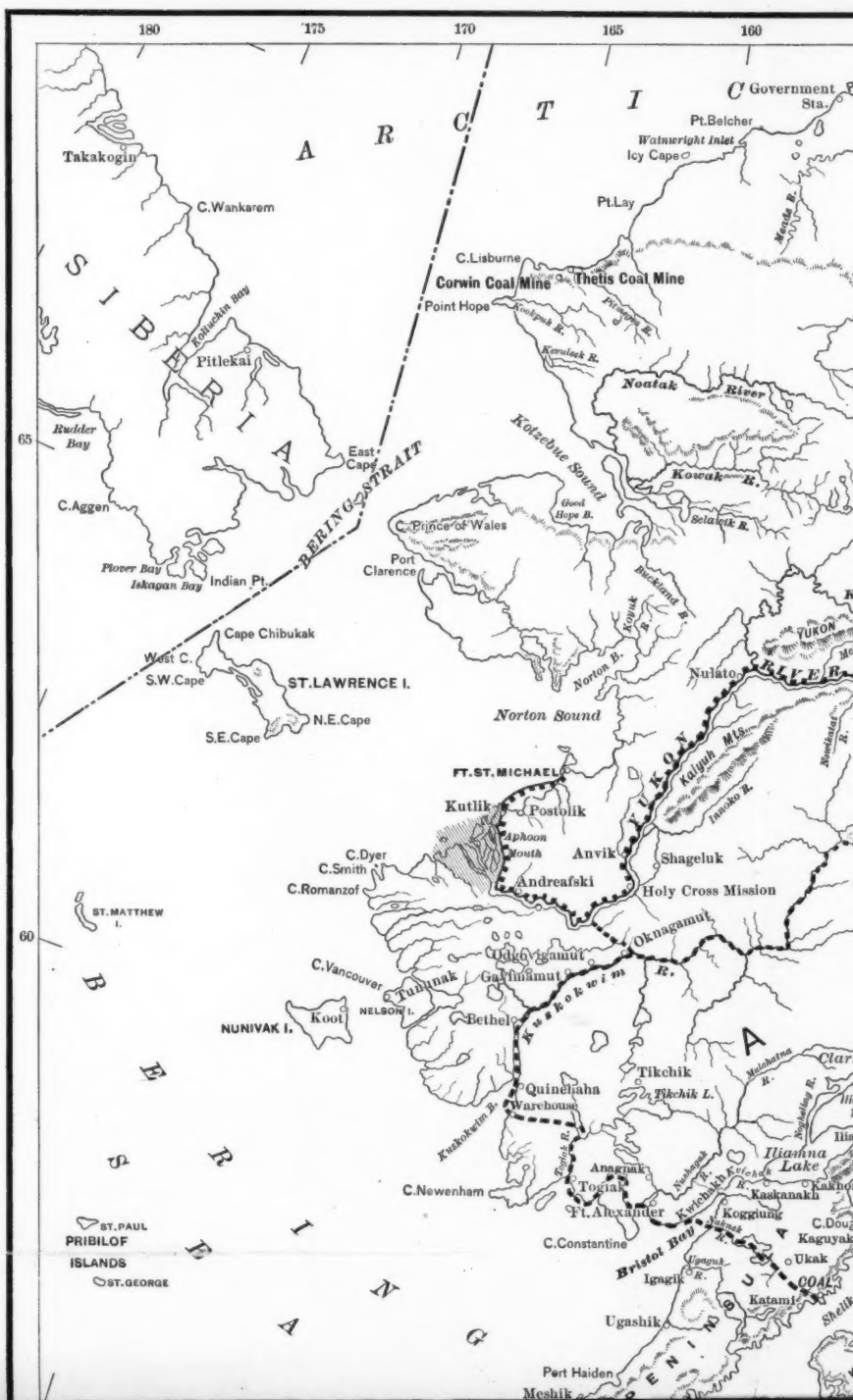
In March last Congress made an appropriation for the exploration of Central Alaska, to be conducted by the U. S. Geological Survey, and another appropriation for the conduct of a somewhat similar expedition by the War Department, the object being primarily to determine the limits of the gold deposits, and incidentally to examine into the other economic resources of Alaska, as well as to ascertain the practicability of building railways and highways within our territory.

Owing to the late date at which both appropriations were made, these expeditions were necessarily prepared in great haste and sailed for Alaska during the first week in April. Yet in spite of the shortness of the time few such enterprises have been better equipped or more successfully prosecuted. The outbreak of the war interfered materially with the expeditions sent out by the Army. Fortunately, however, each of these had attached to it a geologist of the U. S. Geological Survey, and these men with the remnant of the Army expeditions were able to continue their explorations.

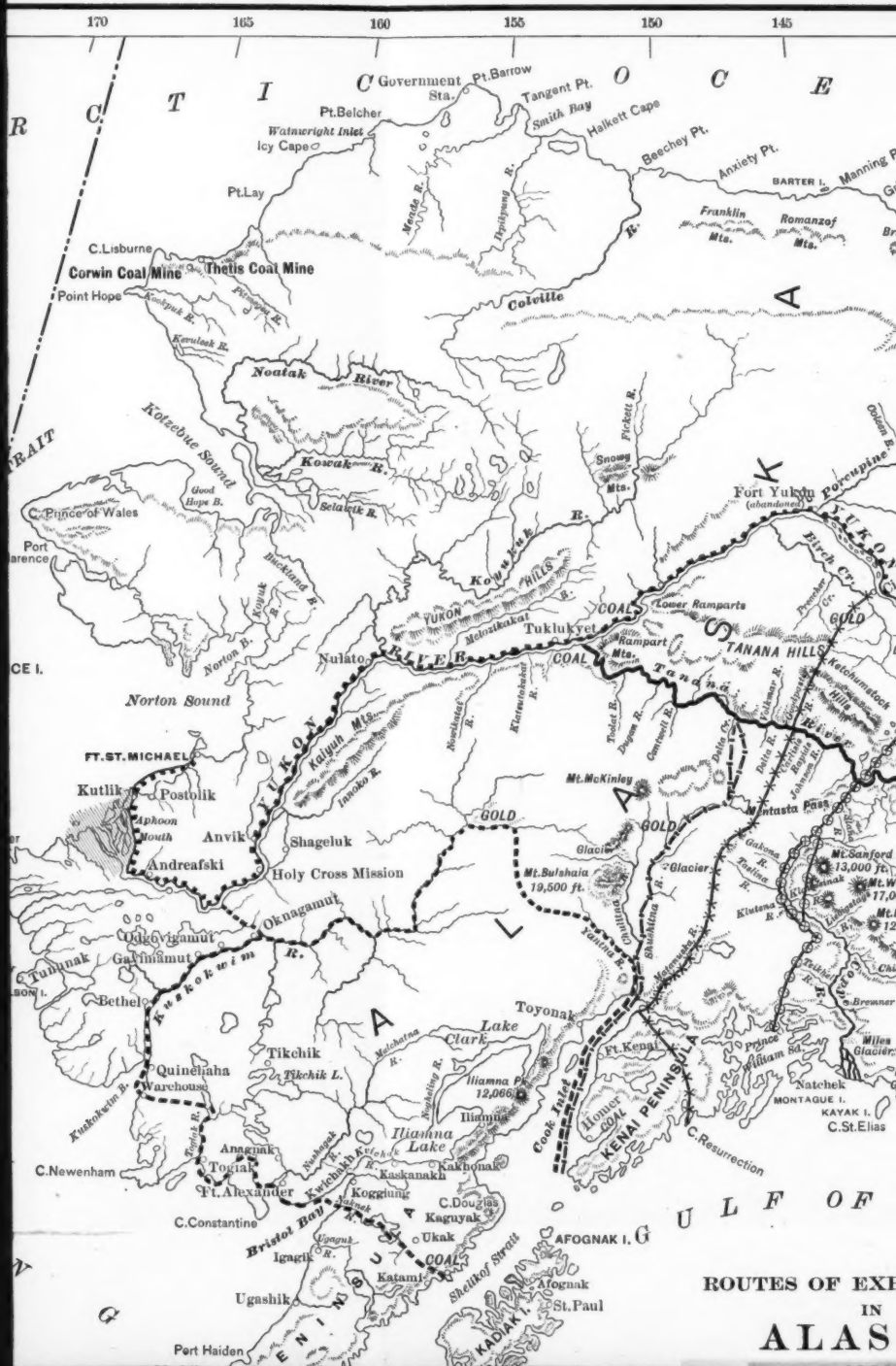
In all, six overland exploring parties entered Alaska during the spring, in addition to a large force sent by the U. S. Coast and Geodetic Survey to map the entrance to the Yukon River near St. Michaels. The two Army expeditions consisted of troops from Vancouver Barracks and the two geologists, Messrs. Mendenhall and Schraeder. These parties were landed at the mouth of the Copper River and started out, one going northerly and the other northeastwardly toward the Yukon River. The work of these parties was arranged in co-operation with that of the U. S. Geological

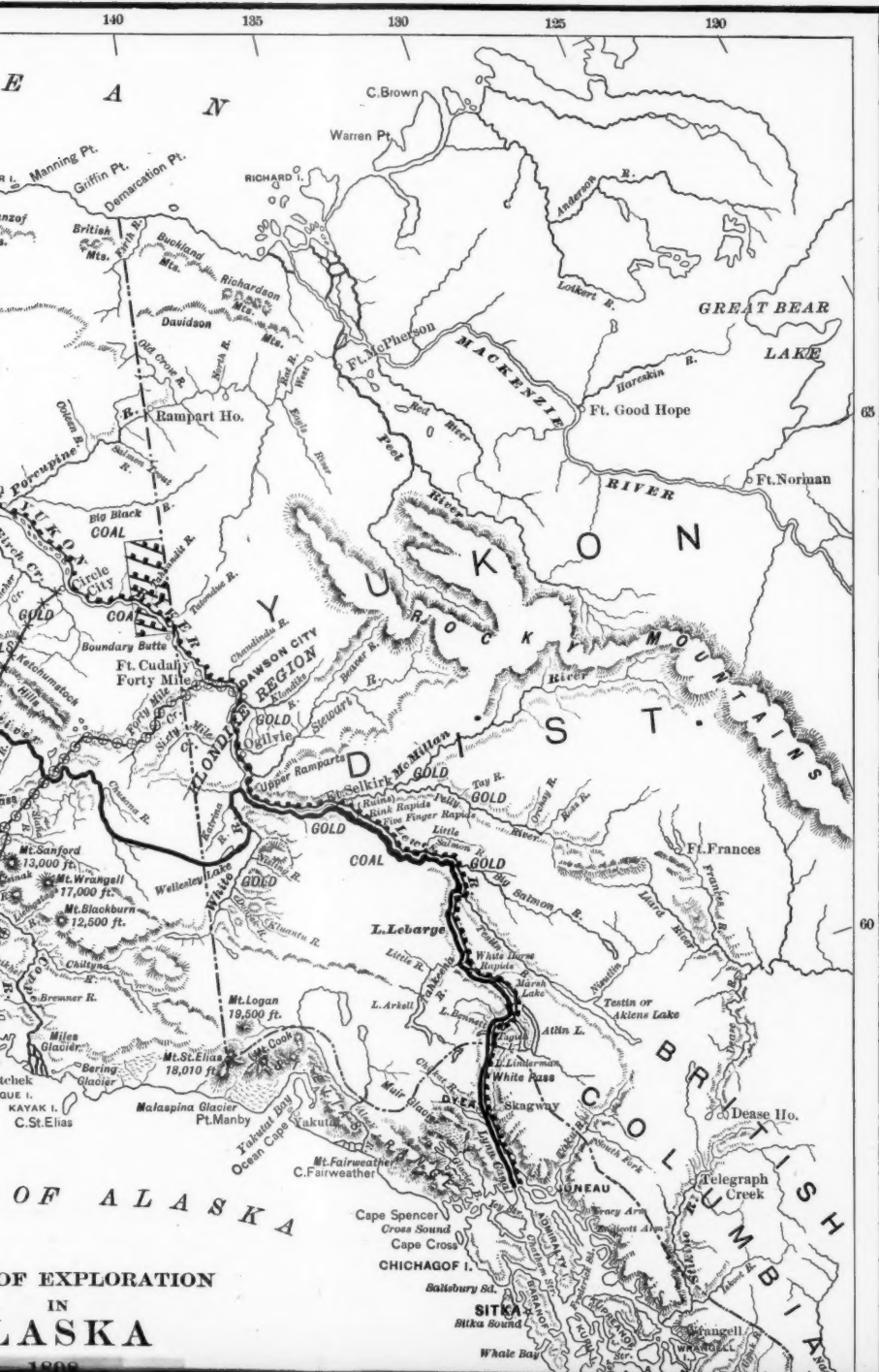
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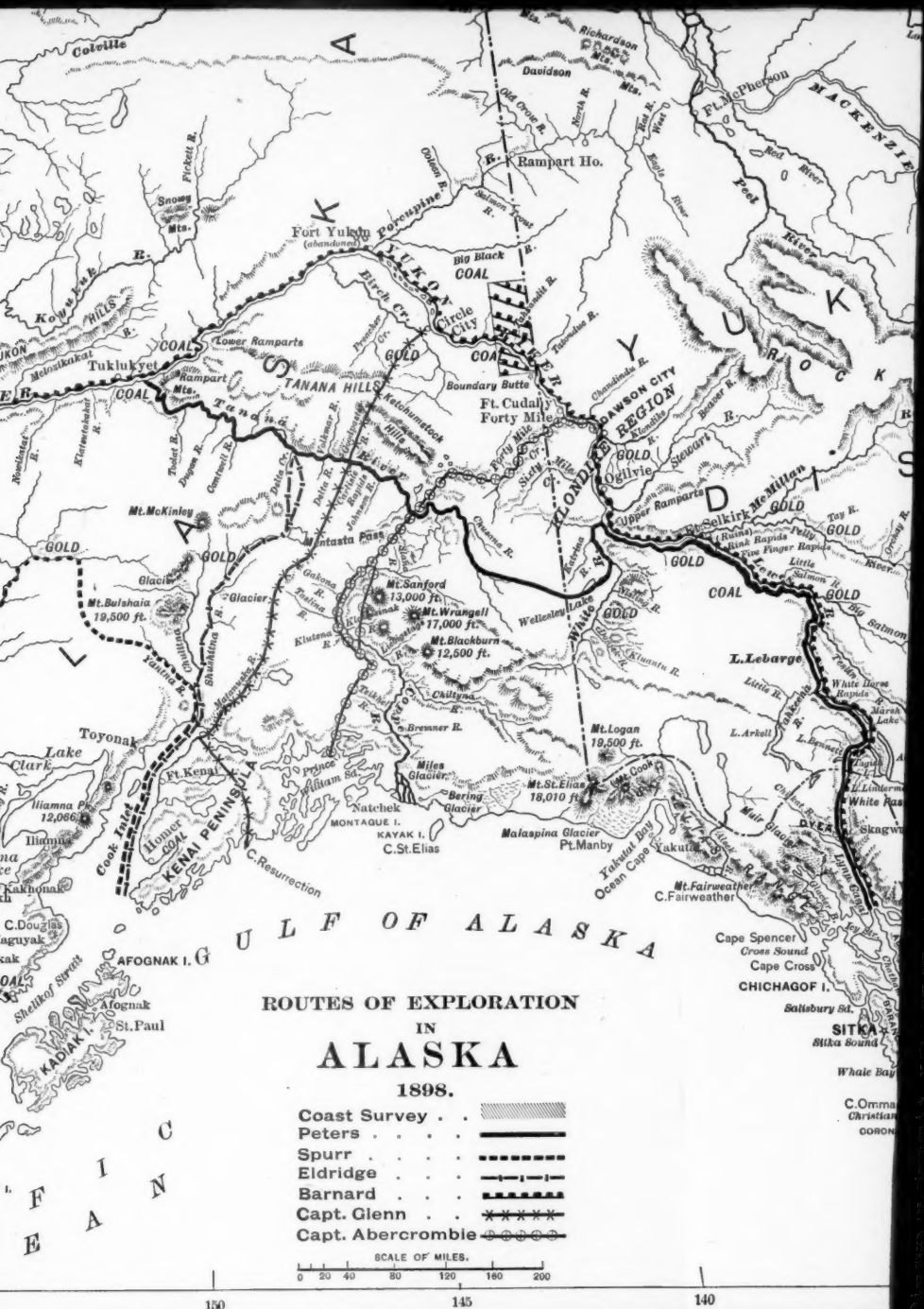


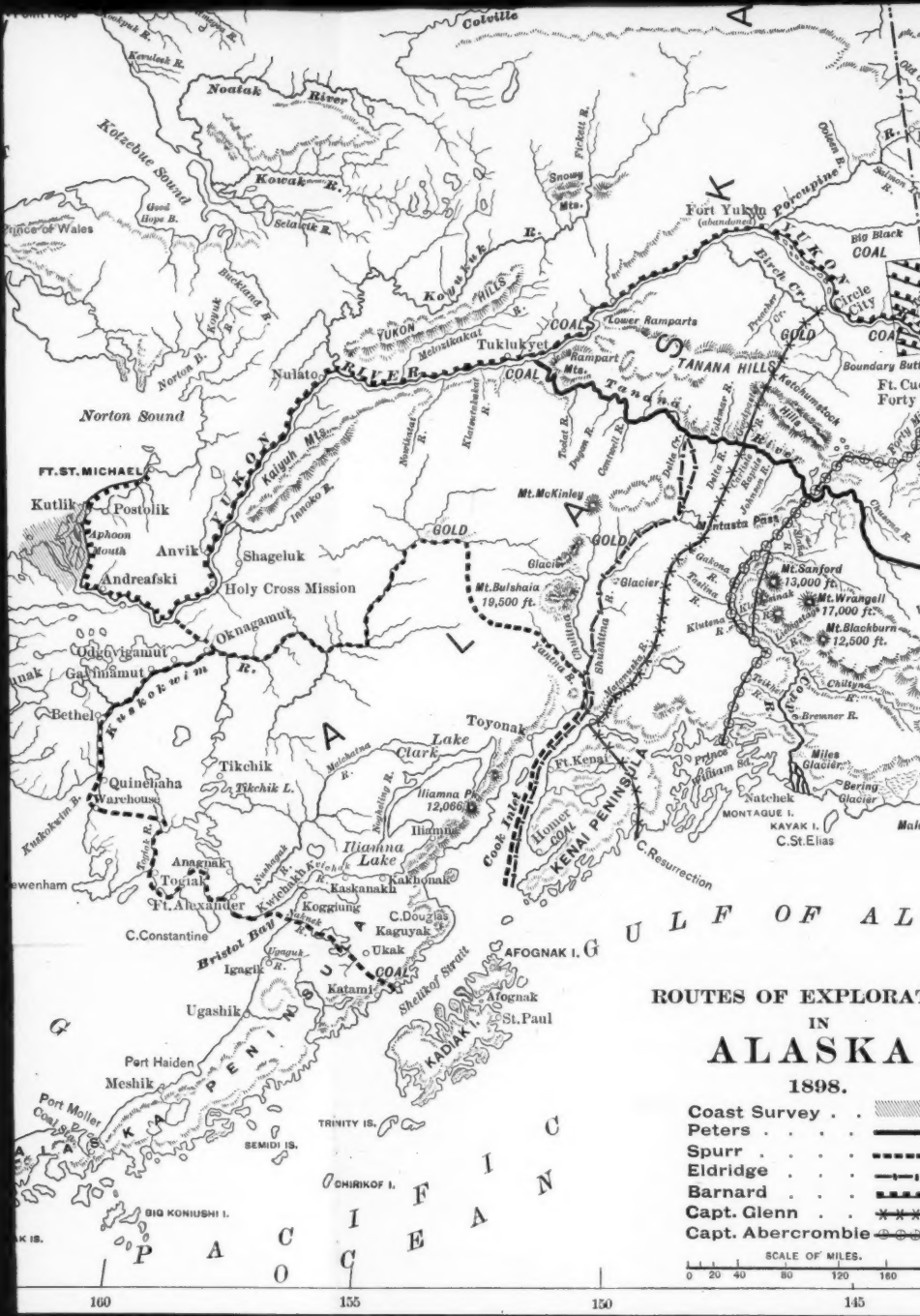












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Survey in such manner that the topographic and geologic results of each should supplement those of the other.

The U. S. Geological Survey sent out four expeditions. As shown on the accompanying route map, two of these were to start from the head of Cook's Inlet on the south coast of Alaska and travel, one northeastwardly and the other northwestwardly to the Yukon, and were to rendezvous at St. Michaels in the early fall. The other two were to take the customary route from Skagway over White Pass and down the Yukon. One of these was then to start in near the mouth of White River, cross to the headwaters of the Tanana and down it to the Yukon, rendezvousing with the others at St. Michaels. The fourth, instead of making an exploratory survey of the route traversed, like the other three, was to continue on to Circle City, there to make a detailed topographic and geologic survey of an area of a couple of thousand square miles.

Each of these parties consisted of a geologist and a topographer, one or other being in charge according to his rank in the force of the Geological Survey, and, in addition, there were from four to six laborers to pack the outfits, row boats, etc. These parties were peculiarly well equipped for their work both in personnel, instruments and supplies, and neither thought nor money was spared in outfitting them in such manner as would increase the chances of success. As a result of this, and in spite of the hardships and difficulties which were encountered in travelling overland in so inhospitable a country, all accomplished satisfactorily the tasks allotted them, and without delay or loss from sickness or serious mishap.

The task set these parties was stupendous. Compared with it the usual journey of the gold seeker of the Klondike was but a summer pleasure jaunt. The miner travels over well-known routes up the Yukon River, or over trails and down streams so thickly inhabited that he is rarely out of the sight of his fellow prospectors. The Government exploring parties, however, followed no beaten path, neither had they placid and well-known streams to navigate. Each plunged at once into the unknown interior, making its way in a specific direction, yet over great mountain ranges and trackless wastes for distances of six hundred to seven hundred miles each between the starting point and the Yukon. After arrival at the latter they had still hundreds of miles of boating to the end of the Alaskan journey at St. Michaels.

For transportation they took specially designed canoes, so light as to permit of being carried from one navigable stream to the next, and all bedding, provisions and instruments were transported in

these or packed on the backs of the members of the parties. When it is realized that most of the smaller rivers of the inland are shallow streams, filled with rocks, rapids and cataracts, travel by boat is reduced to anything but a certainty. Where walking was resorted to there were neither roads nor trails to make the task easy, but the bearers of the burdens had to fight their way over rugged mountain slopes covered with masses of loose rock, the crevices between which were hidden with a soft depth of treacherous moss, or perhaps fallen timber or dense underbrush, or forbidding glacier and snowbank barred the way at every step. Finally, the explorers were wet much of the time from rain, mist or frequent fordings of unbridged, icy streams, up which they frequently waded, towing their boats for hours at a time.

The entire expedition was originally under the immediate direction of George H. Eldridge, Geologist, but on their arrival at Alaska the parties separated, when the commander of each assumed independent charge. Mr. Eldridge was accompanied by Robert Muldrow, Topographer, and his party was landed at the head of Cook's Inlet by the U. S. gunboat *Wheeling*. Thence they boated up the Sushitna River to near its headwaters, whence they worked northeastwardly to the mountain divide separating that river from the Tanana. The original plan was that this party should continue down the Tanana to the Yukon and St. Michaels, but the difficulties encountered were such, and the mountain range crossed was so forbidding, that the journey down the Tanana being unnecessary because of its being made by another party, Mr. Eldridge returned by the same route as that on which he entered. This party found that but a short distance from the head of Cook's Inlet the Sushitna was divided into several large rivers, notably the Chulitna, which appeared to be the main stream, and the Yantna, both of which came in from the north and west, and the Sushitna, which bore off well toward the northeast. This latter stream they followed to its head and crossed over a divide of the elevation of nearly three thousand feet to the headwaters of the Tanana. The most notable discovery of this party was the location of a mythical mountain which they identified as Mt. Bulshaia, between the forks of the Chulitna and Yantna. The elevation of this mountain was determined to be a little over 19,500 feet, and, if this height is verified by office computation and the work of the second party, its position will be established as that of the highest mountain in the United States.

The second party was under the leadership of J. E. Spurr, Geologist, assisted by W. B. Post, Topographer. This party accom-

panied the first as far as the forks of the Sushitna, and made its way thence to the westward over the dividing mountain ranges to the headwaters of the Kuskokwim River, down which it floated on improvised rafts, crossing to the Yukon south of St. Michaels. As the members of this party completed their journey early in the season, they returned to the Kuskokwim at Oknagamat, down which stream they continued to the ocean and along the shore to Bristol Bay; there they ascended the Togiak River to Tikchik Lake. Thence they crossed the divide to Nogheling River and into Lake Clark and to their starting point on Cook's Inlet, before the close of navigation in the early winter.

The third and last exploratory party, under the direction of J. W. Peters, Topographer, who was accompanied by Alfred Brooks, Geologist, landed at the head of Lynn Canal at Skagway, thence it took the White Pass route via Marsh and Bennett lakes down the Lewis to the mouth of White River. Thus far this party and the fourth travelled together, their outfits being carried by the regular transportation companies. From near the mouth of White River, Mr. Peters' party ascended a small stream for two or three hundred miles, crossed the dividing mountain range and bearing off northwestwardly, made its way to the headwaters of the Tanana River, down which they travelled to its junction with the Yukon. Each of the three foregoing parties conducted a traverse or route survey, mapping at the same time as much of the adjacent topography as possible, while the geologists made a careful study of the economic resources of the region passed over, and photographs from which to illustrate the resulting reports.

The fourth party, under the direction of E. C. Barnard, Topographer, which entered Alaska by the same route as that of Mr. Peters, continued down the Yukon to the international boundary beyond Forty Mile. There they measured a base line, expanded a system of primary triangulation and completed a careful topographic survey of two thousand square miles of the territory adjacent to the east boundary of Alaska and the Yukon River, covering the more important gold fields in United States territory. This map will be published on a scale of 4 miles to one inch and in 200-ft. contours as one of the regular edition of topographic maps of the U. S. Geological Survey.

Each individual of the eight topographers and geologists was selected for his special fitness to perform the trying duties, not only of travelling an unknown wilderness, but of safely guiding and managing a party of men through the hardships they must encounter

and at the same time of satisfactorily conducting their surveys and examinations. All had had wide and varied experience in similar surveys in the most inaccessible portions of the Western United States and under the most embarrassing conditions which this country can afford. Mr. Spurr made surveys in the Yukon region in 1896 and was therefore tried in the duties which he had to perform. Messrs. Eldridge, Barnard and Peters had spent twelve to fifteen years each on Government surveys in the Appalachian Mountains, the Adirondacks, the deserts of Arizona, the Sierras of California, the Big Horns of Idaho and the Rockies of Montana. The others have had equally varied experience, but for shorter periods of time. The laborers or packers were equally experienced men. All were chosen from the best camp hands employed annually by the many field parties in the Geological Survey. They were the pick of the Adirondack guides and the Minnesota, Idaho and Washington woodsmen. The instruments taken were of the lightest and most portable design, and were carried in water-tight tin cases. All provisions were arranged in small, sealed tin or canvas packages to preserve them from moisture, and light sleeping bags completed the paraphernalia.

The two Army expeditions were equally successful in their results, but as they have not all yet reached the United States the full output of their labors is not known. The party under Captain Glenn started in at the head of Cook's Inlet and ascended the Matanuska River, which is the first important stream to the east of the Sushitna. From the headwaters of this stream they crossed over to the Copper River, where their route connected with that of Captain Abercrombie's party. The same party (that of Captain Glenn) crossed Kenai Peninsula, from the head of Cook's Inlet to Cape Resurrection on the ocean. A branch of this party continued north across Tanana River and the head of Birch Creek to Circle City where they will winter.

Captain Abercrombie's party started in at Prince William Sound, near the mouth of Copper River and crossed Valdes Glacier, where considerable hardship was experienced and a few lives are reported to have been lost. Continuing overland they reached the Copper River near the mouth of Liebigstag River and skirting the Copper River on the low ridges bordering its west shore, they continued to Mantasta Pass, whence they crossed to the Tanana River, intersecting the route taken by Mr. Peters, and continued on to the head of Forty Mile Creek, which was explored in 1896 by Mr. Spurr, of the U. S. Geological Survey, and down this they made their way to the Yukon.

Each Army expedition consisted of about fifteen men, including civilians and packers. Transportation was by pack animals and they proved most satisfactory adjuncts to Alaskan travel. No difficulty was experienced in subsisting the mules on wild feed, and all stood the hardships of the journey admirably, thus materially lightening the physical hardships of the men.

The routes of these parties were so planned in conjunction with the two Army expeditions up the Copper River as to completely gridiron with surveys the great Alaskan interior between the southern coast and the Yukon highway. From the time of their departure in April no word was received from any of these parties, as all were off the beaten track. It had been planned that they should reach St. Michaels about the middle of September in such time as to catch the last steamers for Seattle, and so well did they plan their movements that on the 7th of October, Messrs. Peters and Barnard reached Seattle from St. Michaels, bringing word that Spurr had been heard from and would arrive by a later steamer. Less than a week afterwards Eldridge's party reached Seattle from Cook's Inlet. All had successfully performed the duties assigned them, and as a result have added to our knowledge such a mass of information relative to the geography and resources of interior Alaska as will take that region forever from the realm of the unknown.

The party sent by the U. S. Coast and Geodetic Survey to map the hydrography at the mouth of the Yukon River, subsisted in one of the large vessels of the Coast Survey and had in addition a number of seaworthy launches for soundings and other hydrographic work. This party was under the general direction of Mr. J. F. Pratt, and while their field season was greatly curtailed because of the amount of stormy weather encountered, the results attained were most gratifying. They completed a Coast Survey chart of a large portion of the least known of the various bars and channels at the mouth of the Yukon, and the most important result of this chart was the discovery of a sufficient depth of water in one of the southernmost channels to permit the safe passage of ocean-going vessels. In consequence the trip by this channel shortens the distance between Yukon points and Pacific coast ports by several hundred miles. This party discontinued work in the late fall just before the closing to the navigation by ice, and returned to the Washington office to work up its results.

ABORIGINAL ARCHITECTURE IN THE UNITED STATES.

BY

COSMOS MINDELEFF.

Architecture has been defined by Fergusson, perhaps the greatest of its historians, as "ornamented and ornamental construction." Under that definition the houses of that part of the American aborigines who inhabited what is now the United States have no standing; since they were strictly utilitarian and were neither ornamented nor ornamental. It is true that in the highest types of Pueblo houses we can detect the first faint glimmerings of that art whose presence, according to the definition, constitutes the difference between house building and architecture, but if we broaden the field a little and make the terms synonymous we find that the houses of the American Indians occupy a very important place in the history of architecture and present a phase of human activity which cannot be ignored in the study of that art.

Fergusson himself, some thirty years ago, lamented the absence of knowledge concerning the houses of the American aborigines, and complained that his great *History of Architecture* was incomplete because it lacked that one chapter. Even then the great temples of India, once so great a mystery, were better understood than the ruins scattered over the southwestern part of the United States and in Mexico and Yucatan. That chapter is not yet written, but year by year investigation and study have progressed, and eventually some master hand will gather together the vast amount of data which has been accumulated and will condense it into a few hundred printed pages. In the meantime we can get a glimpse here and there of the meaning of part, at least, of what we have.

More than twenty-five years ago Lewis H. Morgan, often named the father of American archaeology, called attention to the false views then prevailing, and his work on "*Houses and House Life of the American Aborigines*" was the starting point of all later students. He referred particularly to the higher art of Mexico and Central America, which had always been discussed on the lines—picturesque but false—so ably sketched by Prescott in his *Conquest of Mexico*. The architecture of that region was interpreted through the glowing accounts of the Spanish conquerors, and the resulting exaggerated views have thrown a kind of reflected light on

the ruins found in New Mexico and Arizona. These deserted groups of well-built stone houses appealed to the imagination of the early explorers and were linked to the name of Montezuma and ascribed to the Aztecs. By others, the people who built them were regarded as a race apart, who were swept from the earth by some mighty catastrophe. The rank and file of the Navajo Indians, who now live in that country, have much the same idea: if you ask one of them what became of the "narcuzzi"—the people who lived in the ruins—he will tell you that a great wind arose and swept them all away. Fortunately the houses were left, and from a study of the ruins we can tell pretty closely who and what the people were. In Morgan's time all kinds of exaggerated accounts of the ruins were current, as some of them are to-day; but it was said then in one of the leading magazines that "In size and grandeur of conception they equal any of the present buildings of the United States, if we except the Capitol at Washington, and may without discredit be compared to the Pantheon and the Colosseum of the Old World."

At the present day these ideas have almost disappeared. We know that many of the ruins were occupied within the historic period; in fact, we can say that with a few exceptions we know of none which antedate that period, although there is a fair presumption that many of them did. We know that most of the old villages were inhabited by the ancestors of the Pueblo Indians now living in Arizona and New Mexico; that the old house-builders lived under much the same conditions that prevail to-day in that region; and that the cliff dwellings were merely an episode in their history. Knowing this, in the pueblo villages of the present we can study the ruins of the past.

Within the great area now known as the United States, there were at the close of the fifteenth century perhaps half a million Indians, divided into numerous tribes, each with its own habits and customs, and each building its own style of houses. Aside from the villages of the sedentary or pueblo tribes, few of these rose much above the rank of rude domiciliary huts, enlarged perhaps or slightly changed to form the religious edifices or churches of the people. Instead, therefore, of glancing over a list of perhaps a hundred different but rude types, let us look a little more closely at the highest and at one of the lowest classes, both found within the same region and subjected to the same geographic environment—the houses of the Pueblo Indians of Arizona and New Mexico, and the hogans or huts of the Navajos.

Although purely aboriginal in its origin, hardly less so in its

development, pueblo architecture affords one of the best examples in the history of art of adaptation to environment—to the physical characteristics of the country where it is found; and such adaptation to the country and to the life and wants of the people who practise it is the great principle underlying every school of architecture. There is no art which has the same value to the student of archæology and none which makes so clear a record of a people's life and aspirations as the art of house-building. The record is especially valuable because it is made unconsciously; certain wants are met in a certain way, or in a variety of ways, and the various attempts to meet the changing conditions are all crystallized and embodied, as it were, in the expedient which is finally adopted, so that each detail contains within itself a record of the steps which led up to it. This condition is found all over the world, as, for example, in forms employed in stone construction which were clearly first used in wood, and while well adapted to the latter are hardly suited to the former. Yet they survive year after year and far into the centuries through that conservatism in art which forms the second and not least important element in its development, for without the conservative or conserving element there would be no progress in evolution.

The complete adaptation to its peculiar environment displayed by the pueblo system of architecture shows that it has long been practised under the same conditions as those now prevailing; if not in the same region, then in one like it. It is the product of a primitive people, and like all such people the pueblo builders were and are now peculiarly sensitive to their physical environment and their topographical surroundings. They are truly children of nature and unconsciously put themselves in accord with natural conditions with a completeness and celerity, which is almost incomprehensible to a people whose lives are so largely artificial as our own. Upon such a people the materials supplied by nature are apt to exercise a larger influence on the house-building art than the ideas to which the material was applied.

The ancient pueblo culture was confined practically to the limits of the plateau province, covering perhaps 150,000 square miles in the southwestern part of the United States, and was absolutely dependent upon the peculiar geographic conditions found there. Hundreds of the old villages were constructed of the tabular sandstone found in natural quarries at the bases of the cliffs throughout that region. This stone breaks into small fragments of regular form suitable for use in the simple masonry of the pueblos, without

any labor other than the mere collection of the pieces. This abundance of material, acting in conjunction with certain social forces, prominent among which was the necessity for constant defence, has produced the many-storied hive-like villages which form one of the most picturesque features of New Mexico.

There are at present some eighteen inhabited villages scattered along the valley of the Rio Grande, and a dozen more in the west. Nearly all of them are located in the midst of broad open valleys. This type represents, however, the latest stage in pueblo growth, a stage reached by most of the tribes only within the historic period. Since the earliest times of which we have a record the Pueblos have been subjected to more or less pressure from surrounding wild tribes, who found in the villages convenient storehouses of food, and in the villagers a contemptible foe. It was under this pressure that the great valley pueblos were developed. But many of the earlier types can still be traced in the ruins, and some of them are still in use in the western part of the pueblo country.

From the great amount of data which have been collected it is now possible to form some idea of the sequence in development exhibited by the ruins, although it is impossible as yet to establish a chronologic order for the various types. It seems probable that in the early days of pueblo architecture small settlements were the rule. These were doubtless located in the valleys on sites most convenient for horticulture, each family or gens occupying its own little village. Incursions by neighboring wild tribes or by hostile neighbors gradually compelled the removal of these little settlements to sites more easily defended and also forced the various related families to band together. At a later period the same motive, emphasized perhaps, brought about a further removal to still more difficult sites and the villages were placed on the summits of almost inaccessible *mesas*, as in the case of the Moki village of Shipaulovi. At the time of the discovery by the Spaniards and their conquest of the country the Mokis lived in villages located on foothills of the *mesas*, and many other settlements occupied similar sites at that time. Soon after, the people moved to the tops of the *mesas*. Some of the villages were in this stage at the time of the discovery, notably the Pueblo of Acoma. Finally many villages whose people spoke the same language combined to form one larger settlement, which, relying now upon size and numbers for defence, was again located on the most convenient site, in the broad open valleys surrounded by fine arable lands.

Since New Mexico came into our possession and the pressure of

the wild tribes has been removed from the Pueblos the process has been much quickened, and the old mesa villages are being rapidly abandoned. Indeed, along the Rio Grande, where the settlements were near enough together to render mutual aid, the movement had commenced before 1846, and villages of quite small size were located in the open. The progress in this direction in the past few years has been very great, and in another generation the old pueblo architecture will be known only through its ruins.

The process which I have sketched was by no means continuous. The whole population was in slow migration, but not in the sense in which the term has been applied to European and Asiatic tribes. There was seldom a movement of the people in mass, but a constant although very slow change of base, generally without any definite end in view. Outlying settlements were established for the purpose of farming neighboring fields; these might be found more convenient than the parent village and would eventually surpass it in size and importance, only to be supplanted in turn by their own subordinate settlements. It was an unconscious migration. The tribe might move only twenty miles in three or four generations, or, on the other hand, it might move a hundred miles in a week. But viewed across the centuries the movement may be regarded as constant. It was this slow migration which produced the thousands of ruins scattered over New Mexico and Arizona. These have been used as a basis for estimating a former population of 250,000, or even half a million, although the Pueblos never numbered over 30,000, and there are now 10,000 of them. A band of 500 Indians might leave the remains of fifty villages in the course of a single century.

With the first concentration of scattered houses into villages a new element in pueblo architecture made its appearance. This is the summer shelter, occupied only during the farming season and abandoned for the home village on the approach of winter. This custom was brought about by the scarcity of good land and the difficulty of finding it near the home settlements. Thus many were compelled to go some distance away to carry on their farming operations. The slow migration referred to doubtless had its origin in this custom. The summer shelters form an invariable feature of pueblo life, ancient and modern. They are of various forms, but in function they are all alike. In Moki they are brush shelters; in Zuñi they are single rooms in old ruins maintained in good order while the rest of the structure sank to decay; under favorable geological conditions they become cliff ruins; under other circum-

stances they are cavate lodges. But in one form or another they are always found in connection with the permanent homes of the Pueblos.

The unit of pueblo architecture is the single cell, whether it occurs alone, as in the summer shelters, or in great masses like the huge structures which give shelter to 1,500 souls or more. Sometimes the cells are arranged not in clusters, but in long rows, as in most of the Moki towns. In such cases the houses are usually only one or two stories high. In Zuñi, the largest of all the pueblos, the houses occur in irregular groups and, as a rule, are two stories or more in height. Some of the Rio Grande villages are laid out on a similar plan. As none of the villages except Taos and Acoma now occupies the same site that it did when discovered some 350 years ago, they are in a sense all modern, and reflect modern rather than primitive conditions.

The old architecture has been much influenced by contact with the Spanish and afterwards with the Mexican population of New Mexico. The old plan of terraced construction, a characteristic of the pueblo system, is still apparent, the upper stories being set back from the lower in a series of receding steps or terraces, but the former requirement that the first tier of rooms should afford no opening on the ground has been done away with since the possibility of an onslaught by savage foes has been removed. Formerly the only means of access to the first terrace was by a ladder to the roof, thence by another ladder into the interior, and as these ladders were easily removed each house cluster was in effect a fortress. The terracing of houses reaches its greatest development in the villages of Taos, on the upper Rio Grande, and Zuñi, near the Arizona boundary. At one place in the latter it is possible to count seven stories by passing from terrace to terrace, but a plumb-line dropped from the roof of the uppermost one would pass through only four rooms to reach the ground.

As a rule the masonry of the eastern villages is covered with a finish of mud mortar, giving them a pleasant appearance, but conducing to poor stone work. In most of the large ruins found in that country no mortar was used upon the surface, but the stone itself was beautifully finished by pecking the surface and rubbing it down after the blocks were placed in position. The same method prevailed in some of the cliff ruins. The finest masonry in the pueblo region is found in the Chaco ruins, a group of old villages in northern New Mexico. Even there, however, the result was obtained by careful selection of material and not by skill in its use.

The best walls usually consist of an outer and an inner face with a rubble filling between. The Chaco ruins belong to the same class as the great valley pueblos, like Zufi and Taos. In other words, they are the remains of important home villages, occupied at a time when the people were driven to abandon their smaller settlements and to congregate in large numbers for mutual defence.

The masonry of the ruins exhibits two distinct types. One consists of carefully selected stones of uniform size laid up in the manner already indicated. In other walls, or sometimes in other parts of the same wall, a beautiful face was obtained by the use of small spawls driven in between layers of selected stones not much larger in size. These walls have the appearance, at a little distance, of a fine mosaic. Occasionally the two systems are combined to form a peculiar banded construction. Here, in the highest type of masonry attained by the ancient builders, we have the birth of that architecture which was defined by Fergusson. In other words, here, for the first time, the old-time architect bethought him to make his construction ornamental, and he succeeded. There is an earlier stage in which the spawls were used only here and there, and appear to be a convenience or a use of old material on hand rather than a striving for an ornamental effect. Unquestionably this finely finished masonry must be ranked far above the plastered surface, no matter how well the latter may be done.

Perhaps the highest type of surface finish is that found in the Casa Grande ruin, on the Gila River in southern Arizona. The building was constructed of rammed earth and has a clear historical record of more than two centuries. Even so long ago it was in ruin, and not greatly different in appearance from what it is to-day. But although the interior walls have been exposed to the weather for more than 200 years their smoothness and fine finish attract the attention of all visitors to-day, as they attracted that of the first Spanish chronicler, who wrote of them, "The walls shine like Pueblo pottery." Just how this durable and fine finish was secured is a mystery which many American builders in that country would like to solve. The exterior walls were not so protected. They are much worn and seamed by the weather and have been undercut at the ground level to a depth of two feet or more. When the ruin was repaired under my direction, some years ago, I took measures to prevent this weathering, but the inner walls I left just as they were, and they will certainly last a generation or two, if not a couple of centuries, longer.

In the inhabited villages of the West the masonry is usually

rough, but the old system of building is much more closely followed. In the Moki villages openings in the first tier of rooms giving directly upon the ground are comparatively rare, and the number of ladders in use is correspondingly increased. These ladders are used everywhere, not only by the men and women of the village, but even by little children who are hardly able to walk, and by the dogs, of which there appear to be a dozen, more or less, for every man in the place.

The building of a house is not such a simple affair as might be inferred from the finished product. Descent and inheritance are in the female line. In fact, the women own all the property save a few personal belongings of the men and their horses. The women, therefore, build the houses, but a house building is always made a social occasion, much like the log-raising of our early days, when the frontier was on this side of the Ohio River. Female friends from far and near gather to take part in it, and usually a man or two of the family is impressed to do the heavy work.

When the material has been brought to the site and everything is ready the priestess of the clan must be notified, and an announcement to the neighbors is made from the house tops by a crier. The chief of the village provides four eagle feathers with a short cotton string attached to the stem of each. These are sprinkled with sacred meal and prayers are breathed upon them for the welfare of the occupants of the house, and that the walls may take firm hold upon the ground. The feathers are laid at the four corners of the house and a large stone is placed over each one. The place where the door is to be is marked by bits of food on each side of the opening, this ceremony being accompanied by prayers to the sun that there may be always an abundance of food within. The lines where the walls are to be are marked on the ground by particles of bread and other food mixed with the native tobacco, the sacred plant. The women then proceed to lay up the walls. When the structure reaches a height of seven or eight feet the roof beams are put in place. These beams are often brought great distances, for suitable timber is not to be found everywhere. According to the Moki traditions the timbers used in the construction of the mission buildings erected in the 17th century were brought on the backs of men from the San Francisco Mountains, more than a hundred miles away. Some of them are still in use in native structures, (for the Mission buildings have long since disappeared,) and are still pointed out to the curious.

The roof beams are covered with smaller poles, and with brush

and grass, and are finished with earth, a mud floor is made inside and the walls are plastered with the same material, the whole being nicely smoothed by hand. Formerly a custom prevailed of leaving a small space in the wall bare, under the belief that one of the gods came and finished it. Although this spot remained as it was left, it was supposed to be covered with an invisible plaster. When the house is completed to this point four more feathers are prepared and tied to a short stick, which is inserted over one of the central beams. The feathers are renewed every year in December, when the sun begins to return northward; that is, at the winter solstice. The ceremony of "feeding the house" is then performed. This is an offering to the sun and consists of placing bits of food among the rafters, with prayers to the sun that he will not hasten the departure of any of the occupants to the underworld. A fire-place is then built in one corner and a bin-like arrangement containing three or four flat stones for grinding corn in another. The house is then ready for occupancy. The door is merely an opening closed by a blanket in cold weather. Rude as it is, the interior of a pueblo house is quite comfortable.

Oddly enough the ground plan of a village is dictated by the number of girls who live there. Not only do the women own all the property, but when a man marries he goes to the home of his wife and becomes an adopted member of her family. A family in which there are many girls must increase and multiply, and as house space becomes inadequate must build new rooms adjoining, while one in which there are only sons must become extinct in the next generation.

In its general outlines the pueblo system of architecture can be traced through its various stages, from the primitive earth lodges, like those in use by the Navajos, up to the many-storied clusters which mark its greatest development. The various steps have followed from a simple and direct use of such material as was immediately at hand, combined with conditions which compelled the frequent use of that material, among them the slow migration which was in progress in all the tribes, and the ever present necessity for defence against a strong foe. The results attained testify to the patient industry of the pueblo builders rather than to skill in construction, for the best walls which have been found are the result of careful selection of material only. It will be interesting now to look at the Navajos, who for many generations have lived under the same physical conditions.

A greater contrast than that between the puny and rather feeble

Pueblos and the athletic Navajos could hardly be found. Magnificent six-footers, living in the saddle from their earliest childhood, descended from a long line of freebooters and robbers who preyed upon all the surrounding tribes, the Navajos fear nothing save the anger of their gods or the ill opinion of their fellows.

Prior to our conquest of the country in 1846 they lived chiefly by war and plunder. The Mexican settlements along the Rio Grande and the Pueblo villages of the same region were the principal contributors to their welfare, and the thousands of sheep and horses which were stolen then formed the nucleus of the immense flocks and herds which constitute their wealth to-day. It took a long time to persuade the Navajos that a change in their methods of life must follow the new régime, and the war which followed was brought to a close only by a resort to the most drastic and barbarous measures on the part of our troops. The fields of the Indians were burned over, their orchards were cut down, and squads of soldiers were stationed at every spring and water hole to bayonet the sheep and horses that came to drink. Eventually the Indians were brought to terms, and we have had no real trouble with them since, although almost every year the troops scurry out into the Reservation to keep down some threatened outbreak.

The houses of these people are earth-covered huts, and as a rule each one stands by itself. They are usually so hidden away that a traveller who is not familiar with the customs of the Indians might journey for days and not see half a dozen of them, and he would be apt to get the impression that the country is practically uninhabited. He might hear the bark of a dog in the distance, or far away on the mountain side he might see a pillar of smoke like that rising from his own camp fire. Yet the tribe numbers more than 12,000 souls, and there was probably no time during the day when several pairs of eyes were not watching his movements. Were he to fire his gun the report would be heard by several hundred men. Probably this custom of partly concealing their habitations is a survival from the time when the Navajos lived in momentary expectation of reprisals on the part of their victims.

The hogans intended for permanent use are always constructed after a fixed pattern, no variations from which are permitted, although in the valleys it is often difficult to procure suitable timber. They are invariably built with an entrance made in the fashion of a dormer window. When the Navajos finally realized that they would not be allowed to plunder their neighbors they utilized the enormous flocks they had and became a pastoral people. Under

recent conditions they are becoming farmers and, like the Pueblos, they have developed the use of farming shelters, which are commonly half huts. The Navajos never congregate into villages, however, and the movement from the winter hut to the summer shelter is merely a change from one part of the country to another. Sometimes the summer shelters are merely rude shelters of cedar brush and logs. Sometimes they are regular winter huts in all respects save the final earth covering. But the summer houses can always be distinguished from the regular huts because the latter must and invariably do front the east, no matter if by so doing they look directly into the side of a hill. In fact, rude as the winter huts appear, every detail in them is dictated by an elaborate ritual and strict ceremonial requirements.

Among these Indians there are many myths and legends of wonderful houses built by the gods. In them turquoises and pearly shells were used, as were also the filmy mists of dawn and the gorgeous hues of sunset. They were covered with sunbeams, and rainbows, and everything beautiful in the earth and sky. In the construction of a hut to-day the door is invariably placed toward the east, in order to allow free access to the kindly influences of the God of Dawn. Each timber must be placed in its regular order and in a prescribed way, the neighbors and friends of each builder assisting in the construction.

A great change is now taking place among the Navajos, for, owing to the present conditions, they can no longer make a living from their flocks, and they are slowly but surely being forced to cultivate the land. The contrast between the passing and the rising generation is marked. Among other things the old hogans, with their elaborate ceremonial of dedication, are passing away, and are being replaced by houses modelled on the American plan. Such houses are a wide departure from the old ideas of the Navajos. They are rectangular in plan, sometimes with a board roof, and occasionally they comprise several rooms. In the mountain districts many of them are built of logs hewn square before being laid in place. Such houses render impossible the ceremonial of dedication, and the old rites are gradually falling into disuse.

The beliefs of the Navajos in regard to their dead for a long time prevented any departure from the ancient type. In the cañon country and especially where there are cliff ruins—which are regarded as sacred—the dead are placed in burial cists. These are generally constructed in a ruin. Out in the open country, comprising most of the Reservation, this is impracticable, and the hut

in which a man has died is pulled down over the remains and set on fire. After that nothing would induce a Navajo to touch a piece of wood from it, or even to approach the vicinity of the place. Even many years after they are able to recognize these *chindi hogans* or ghost houses, as they are called, and they carefully avoid them. This custom has much to do with the temporary character of the Navajo houses, for men are born to die and they must die somewhere. In recent years, however, the problem of how to build and retain more elaborate houses has been solved in a way which is simple but very satisfactory to the Navajos: when a man is about to die he is taken outside and allowed to breathe his last in the open air.

The remains of a Navajo hogan seem hardly comparable with the houses of the Pueblos, or even with the single-room remains which we call cliff dwellings. Some of the Pueblo tribes have been subjected to almost the same geographic environment as the Navajos, yet the house structures appear radically different. The Pueblo villages, however, are the direct outgrowth of just such lodges as the Navajos use, and the reasons why they have not advanced together lie principally in two causes—antecedent habits and personal character. With their habits as warriors and robbers, combined with their large flocks, which must be periodically moved from place to place, only temporary habitations were possible to the Navajos. On the other hand, most of the Pueblos came into the particular regions where they are found from other similar regions, where they had developed an elaborate system of house building admirably adapted to them. They were in no sense warriors, and all they asked was to be let alone. Dissimilar as the two peoples were, they would have come together had they been left undisturbed; in fact, they had already shown some signs of it, but the introduction of sheep by the Spaniards some 350 years ago emphasized the differences between them. The possession of sheep fell in exactly with the habits of the Navajos, but the pastoral life was impossible to the Pueblos, living as they did in fixed habitations from which they were afraid to venture far. They had sheep, which the Navajos periodically took away from them, but their main reliance for subsistence has always been on the cultivation of the ground. Under the strong arm of the Government, the two tribes are coming closer together. The most timid of the Pueblos are becoming more bold. They are gradually leaving their mesa fastnesses and are building individual homes in the valley below. Incidentally they are increasing their flocks and herds. On the

other hand, the Navajos are slowly taking up agriculture and show some disposition to form communities. Their flocks are decreasing and in a few years will no longer dictate the habits of the people. But as a house builder it is the old Navajo and not the Navajo of to-day who interests us.

In the vicinity of nearly every hogan will be found a primitive loom, upon which the woman of the house weaves the elaborate and gaudy blankets which have recently become an article of barter with the traders. Oddly enough, among the Pueblos the men are the weavers, but among the Navajos a woman is valued almost entirely for her skill in weaving, for blankets are a not inconsiderable asset of a household, and wool which is sold for five cents a pound readily brings forty cents when made into blankets. Not infrequently a loom is set up at some distance from the hogan, perhaps between two trees which are spaced about the required distance apart. Here the women live for a month or more at a time while an elaborate blanket is being made, the lord and master of the house in the meantime going off on a visit to his friends. Although marriage in the tribe is by purchase and a woman is bought from her family for so many horses, the rules of property obtain in her case as in that of the Pueblo women. Everything belongs to her except the horses and cattle. Not even a sheep can be sold to a passing traveller without her consent, and when sold the money received must be handed to her.

It is the medicine men who conduct the dedication of the hogans. This ceremony is regarded as having a very solemn significance by the elders of the tribe, although considered by the young people as principally an occasion for merry-making, as was the old Anglo-Saxon house-warming. It is believed that unless the rites are observed soon after the house is completed, bad dreams will plague the dwellers therein, toothache will torture them, their flocks will dwindle, ghosts will haunt the place, and the house will become tabooed, a place of evil. Accordingly, a few days after the house is built, arrangements are made with a medicine man to come and sing the house songs. For this he receives a good fee. Seating himself so as to face the doorway and the east, he sings a number of songs addressed to all the cardinal points, for in the Navajo system different groups of deities are assigned to each of them. This ceremony is known as the twelve songs, although in fact there are only two of them, each repeated twelve times. He prays for "male rain," such as accompanies thunder-storms, and for "young rains" or showers coming directly from the east. Both are regarded

as necessary to fertilize the soil. He prays also that the house may cover many "hard possessions," such as turquoise, coral and silver, and "soft possessions," such as blankets and buckskins. The ceremony, which commonly begins at nightfall, is prolonged by invocations to the sun and to the dawn, to the twilight, to the light and to the darkness, to the six sacred mountains, and to numerous other deities. Invocation is also made to evil things, to coughs and lung troubles, to the sorcerers, and to others, beseeching them to keep away. The whole ceremony is so timed that it is completed just as the first grey streaks of dawn appear, when the visitors get up their horses and ride home.

RECORD OF GEOGRAPHICAL PROGRESS.

AMERICA.

RAIDS OF THE ONAS ON FLOCKS IN TIERRA DEL FUEGO.—Dr. H. Polakowsky writes in the *Verhandlungen* of the Berlin Geographical Society (No. 7, 1898), that the remnant of the aboriginal Onas living in the Chilian portion of Tierra del Fuego are about to be removed to the Dawson Island because they have killed several Chilians and, driven by hunger, have made war upon the sheep herded there which they call "White Guanacos." The Guanacos which were formerly in great numbers in Tierra del Fuego were the mainstay of the natives for both food and clothing.

HIGHEST KNOWN POINT OF THE WESTERN WORLD.—Mr. E. A. FitzGerald in his paper read before the Royal Geographical Society (*Geog. Jour.*, Vol. XII, No. 5) says that the summit of Mount Aconcagua, a little east of the boundary between Argentina and Chile, and which, as far as is known, is the culminating point of the Americas, is a square plateau 75 paces each way, sloping at an angle of 7° towards the north. When his party visited it last year the summit was entirely free from snow. The western and north-western sides of the mountain fall away at an angle of 20° and present long slopes of loose stones which are kept clear of snow in summer by the winds that sweep them. On the south and south-west the sides are more precipitous and also fairly clear of snow and ice; but on the southeast there is an enormous precipice of nearly 10,000 feet covered with great overhanging masses of snow and ice, forming a very imposing spectacle.

To the northwest the line of the Pacific was in view stretching away for over 150 miles. Range after range of mountains could be seen between Aconcagua and the ocean. Nothing could be seen of the pampas of Argentina, too many ranges of high mountains intervening. To the south there was a fine view of Tupungato, fifty miles away and about 22,000 feet high. At the time Mr. FitzGerald read his paper the calculations as to the height of the mountain, based on the data collected by Mr. Lightbody, had not been made. Its height had been previously estimated at from 22,421 to 25,000 feet.

Prof. Bonney, basing his remarks upon the geological collections

brought home by the party, said that while both Aconcagua and Tupungato are volcanic, the craters have wholly disappeared. From Aconcagua itself no scoriaceous specimens were brought back, and this fact combined with enormous precipices on the eastern side, leads him to suppose that beds of lava enter very largely into the composition of that peak. The present summit is either a dyke in the wall of the old crater, or else the actual lava plug which has choked up the bottom of it. Consequently the whole of the crater is gone, and that which was the lowest part is now the highest. So that it may be fairly assumed that one or more thousand feet once rose above the present top of Aconcagua.

SEALS IN A LABRADOR LAKE.—Mr. A. P. Low, of the Geological Survey of Canada, in his "Report on a Traverse of the Northern Part of the Labrador Peninsula from Richmond Gulf to Ungava Bay," says that in Seal Lake, fifty miles long and from a half mile to five miles wide, nearly 800 feet above the sea and about 100 miles distant from it, either the common harbor seal (*Phoca vitulina*) or a closely allied species, lives and breeds in considerable numbers, thirty or more being killed annually by the Indians. The seals are thought to have come into this lake during the Champlain submergence, which must have nearly or quite connected it with Hudson Bay; and having found it full of fish, they probably lost the inclination to return to the sea.

Mr. Warren Upham, commenting upon the above in the *American Geologist* (No. 5, 1898), says that this explanation, which is doubtless true, refers to a simple and somewhat uniform epeirogenic uplift less complex and less prolonged than the earth movements which will be found to account for the seals and many species of marine crustaceans in the great Siberian lake Baikal, about 1,500 feet above the sea and having a maximum sounding of 4,746 feet. In both these instances the connection with the sea was geologically recent, in contrast with the probably remote time when Lake Tanganyika, 2,680 feet above the sea and of undetermined depth exceeding 1,200 feet, received its jelly fish and numerous species of mollusks, prawns, and protozoa of marine derivation. Orogenic as well as epeirogenic movements with profound crustal deformation quite certainly shared in separating the basins of these greater fresh-water lakes from the ocean, giving to them a far more complicated history than that of Seal Lake, which merely participated with all the Labrador Peninsula in a general uplift from the late glacial or Champlain depression.

EUROPE.

THE CANAL FROM THE BALTIC TO THE BLACK SEA.—The digging of the trans-continental canal which is to extend from Riga to Kher-son, Russia, between the Baltic and the Black Sea, began last spring. Starting from Riga the route follows the Dwina River to Dunaburg. From this point the canal will be dug to Lepel upon the Berezina River. It will then follow this stream and the Dnieper to the mouth of the latter river. The route thus utilizes the river courses, and of its total length of 1,600 kilometres only about 200 will be excavated. To enlarge the commercial area to be served by the canal it is proposed to utilize numerous secondary rivers and thus connect the canal with the important towns of Mozyr, Chernigov, Jitomir, Poltava, etc. The canal will be open to vessels day and night. It will take six days for large river vessels to pass through it. Five years will be required to build the canal.

DR. THORODDSEN COMPLETES HIS EXPLORATIONS OF ICELAND.—Dr. Thoroddsen, the well-known explorer of Iceland, writes to the *Geographical Journal* (Nov., 1898), that last summer he completed the geographical and geological researches in Iceland which he began in 1881. He has now examined the entire island. Last summer he investigated the high table lands, northwest of Langjökull in the northwest inland region, examining their physical geography and geology. In the beginning of August he went to the mountain regions behind the valleys of the Borgarfjord, west central coast, where he made some extended excursions.

EXPLORING RUSSIAN LAKES.—Ladoga and Onega lakes, among the largest in Europe, with a total area of nearly 28,000 square kilometres, although in the neighborhood of St. Petersburg, have never been adequately explored. Last summer the Imperial Geographical Society sent an expedition to these lakes to study the temperature of the water at various depths, and ascertain the contour of the bottoms and other peculiarities.—(*Verhandl. of the Ber. Geog. Soc.*, No. 7, 1898).

CAUCASIAN GLACIERS RETREATING.—Prof. Muschketoff records the fact (*Izvestia, Imp. Russ. Geog. Soc.*, No. 4, 1897) that observations at eight glaciers in the Caucasus extending over a period of eight to ten years show that they are steadily receding. The termini of the glaciers are retreating from nine to thirty-eight metres every year.

OPENING A NEW RUSSIAN FOREST DISTRICT.—Mr. Henry Albrow writes to the *Journal* of the Manchester Geographical Society, that the hitherto unavailable forests of the extreme northeast part of Russia in Europe are about to be made accessible, and within a short time the fine redwood trees of those virgin forests bordering on the Arctic circle will be put upon the English and other European markets in the shape of lumber. A commission has been granted to a strong Swedish company with cutting rights to fell about one million trees in the basin of the Petchora River, and arrangements have been made for transportation of the logs down to the mouth of the river and along the coast westward to the port of Oserka on the Murman coast, Kola Peninsula, within a few hours steaming of the Norwegian frontier. The mouth of the Petchora is free from ice and open to navigation for only three months in a year, but it is thought feasible to convey sufficient logs during that time to the saw-mills at Oserka to enable them to cut lumber practically the whole year. Oserka being an ice-free port, the export can be carried on during nine or ten months of the year. The redwood trees on the west slopes of the Ural Mountains in the Petchora basin are of excellent quality and large dimensions. The Petchora is navigable from its source on the western slope of the mountains to its outlet in the Arctic Sea opposite Novaya Zemlya, 700 miles. Navigation, however, is difficult in its delta. The new saw-mills at Oserka will have a sawing capacity of 300,000 logs a year and vessels can load alongside the quays.

ASIA.

EXPLORING SOUTHERN ARABIA.—One of the unexplored areas of the world is the interior of Southern Arabia. The Vienna Imperial Academy of Sciences (*Globus*, No. 16, 1898), has sent an expedition to explore this region and in particular to examine the extensive ruins in the Hadramut. The expedition will probably last from four to six months. This region was once a very important trade centre and associated with interesting phases of ancient history, and the expedition is expected to attain valuable results from the study of the ruins of the old civilization, as well as from its researches in geographical and geological science. The Academy has the coöperation of King Oscar of Sweden, who assisted it to secure in Stockholm the steamer Gottfried, 700 tons, which is equipped with all appliances for such a journey. Count Karl Landsberg, the Swedish Arabist, who long resided on the south Arabian coast and established friendly relations with some of the Sheikhs of

the interior, is the leader of the expedition, assisted by Dr. D. H. Müller, professor of Semitic languages at the University of Vienna. Dr. Alfred Zahn, Prof. Oskar Simony (son of the late Austrian geographer) and Dr. Franz Kossmat, of the Imperial Institute of Geology, a former pupil of Suess and Penck, are other members of the party.

GOLD ON THE COASTS OF THE OKHOTSK SEA.—The Russian Government has received a report from the expedition sent out under Mr. K. T. Bogdanovich to explore the east coast of Siberia from the town of Okhotsk to Chumikan, at the southwest corner of the Okhotsk Sea. Gold was found in paying quantities in a number of the rivers flowing into the Okhotsk Sea, and also on the slopes of the low mountain ranges which run almost parallel with the coast. Alluvial gold was found in several places which resembles that of the Amur territory and particularly that of the Seja basin. The cold climate is an impediment to mining. Midway on the coast is the hamlet of Ayan, whose excellent harbor is free from ice five months in the year.—(*Verhandl. of the Ber. Geog. Soc.*, No. 7, 1898.)

CARAVAN ROUTES IN PERSIA.—Persia, which is about five times as large as Great Britain and Ireland, consists, for the most part, of an elevated plateau, intersected by barren mountain ranges which run east and west and die out near the eastern frontier. There are only a few rivers, and these are small. There is a large area of salt desert. Where there is water the fertility is prodigious. The population is sparse and probably does not exceed 7,000,000 souls. The route to Trebizond, on the Black Sea, is the only land-trade route to the west, and this used to be the main route for traffic to and from Europe till the near approach of the Russian frontier, and the import of Russian goods *via* the Caspian on the one hand, and the Suez Canal on the other, crippled its importance. Still, trade follows this route in spite of its passing through Turkey and the country of the unruly Kurds, and although its outlet on the Black Sea is off the highway of sea-borne traffic.

The average height of the Elburz range on the north is 11,000 to 12,000 feet, and the passes over it vary from 6,500 to 10,000 feet in altitude. It should naturally seem that trade routes would avoid the mountain ranges, which form the retaining walls of the Great Central Plateau on its northern and southern sides, and that they would enter Persia either from the east or west and so escape the main obstacles to a good road. From the east, however, south of

Herat, there has been no land traffic until recently. The Government of India is now encouraging a trade route from Baluchistan to Seistan Province in southeast Persia, and it is said to be proving a great success.

At present, merchandise and travellers are carried by means of either camels, mules, ponies or donkeys. These are formed into caravans. In the case of pack-animals, the load varies with the size and age of the beast. Packages of 200 pounds each, making a total weight of 400 pounds, is about the average camel-load. The camels are tied in long strings, the halter of each being fastened to the tail rope of the one before him. From fifty to sixty walk in a line at a pace of about two miles an hour.—(*Lieut.-Col. Henry Lake Wells in the Journal of the Manchester Geog. Soc.*, Nos. 4-6, 1898.)

AFRICA.

CROSSING THE SAHARA IN A BALLOON.—Lieut. Hourst, the explorer of the middle Niger, contemplates crossing the Sahara in a balloon. Starting from the Gulf of Gabes he hopes, with the help of the northeast winds, to cross the waste to the north bend of the Niger. He expects to be accompanied by the aeronautic experts, Léo Dex and Capt. Dides.

POLAR REGIONS.

Of the various Arctic and Antarctic expeditions now in the field, very little has been heard.

The failure of the *Windward*, Mr. Peary's ship, to return by December 1st, establishes beyond reasonable doubt the assurance that she will not come south until next summer or fall. As the wintering of the *Windward* in the pack was one of the contingencies provided for, little need be feared for the safety of the ship's company, all of whom are picked men—Newfoundland sealers, accustomed to work in the ice.

While the return of the ship would have brought us definite news concerning the exploring party, her failure to return this fall allows the reasonable and encouraging conjecture that she reached so high a latitude before disembarking Mr. Peary and his party, that she was not able to clear the pack before the ice sealed the channels. Of course every degree of latitude passed by the *Windward* on her northern course means just so many miles of weary tramping saved to the explorers.

The captain of the *Hope*, S. W. Bartlett, a brother of Captain John Bartlett of the *Windward*, says in a recent letter:

"My brother informed me before leaving, that if the ship was all right, and it did not break up (in the ice) that he would abandon on the 20th of August. I hope they got up to Discovery Head. The ice was very heavy, and we had considerable trouble getting out of Port Foulke, but apparently there seemed to be no obstacle in their course to Cape Sabine. I am inclined to think that the season set in early. We found the young ice stiff in crossing Melville Bay on our way back, and the whalers that arrived at Dundee, September 25th, report heavy frost and that they at one time thought they were caught for the winter."

We get from the *London Times*, through its correspondent on board the *Fram*, details of the voyage of Capt. Sverdrup's expedition across the Atlantic, to Godhavn, Greenland, where it arrived July 30th.

Continuous headwinds and stormy weather drove the *Fram* out of her course, and well up under the Faroes and Iceland. From the report it would appear that the ship rolls violently and makes but little way against headwinds.

While off Cape Farewell, on July 19th, the *Fram* ran into the ice and for two days pushed her way between the pans, which were unusually abundant this season in that latitude.

Along the western coast of Greenland the conditions were not at all favorable. The ice kept the *Fram* out of Sukkertoppen, but she succeeded in reaching Egedesminde, where thirty-six dogs were taken aboard. More dogs were to be embarked at Godhavn and Upernavik, whence the course was to be shaped for Cape York.

Meteorological and other observations were commenced early on the voyage, and several enclosed messages had been thrown overboard before reaching the neighborhood of Cape Farewell.

The Scottish Geographical Society issued in October a "Special Antarctic Number." Many distinguished scientists set forth the reasons for believing that a well-equipped expedition to the Antarctic regions would yield most valuable results.

In the same number the acting editor, Mr. W. A. Taylor, presents a most interesting "History of Antarctic Discovery."

Despatches from Hobart, Tasmania, state that the British steamer *Ruahine*, which had arrived there, reported that on November 20th she spoke the steam whaler *Southern Cross*, bearing the Borchgrevink expedition to the Antarctic Continent. All on board were well.

The *Geographical Journal* for November has a letter from Mr. H. C. Russell, the Government astronomer of New South Wales, on the subject of the limitation of the Indian Ocean field of ice-

bergs between 40° and 90° East Long. and 40° and 50° South Lat.

He thinks that this limitation is perhaps rather apparent than real; the number of ships passing through that region making the number of *reported* icebergs greater than in tracks to the north or south, where comparatively few vessels pass. Another probable cause is the Antarctic current which sets to the south near Kerguelen. He concludes:

"I think these reports are too condensed. We want the icebergs for each month and each year plotted, each on a separate chart, with currents, winds and weather shown, and then a careful study of the whole would, I feel sure, help us very materially in grasping the whole difficulty of the *iceberg*; and my pet scheme, were the money available, would be to send a party of competent observers in a suitable steamer to go amongst the icebergs in latitudes used for commerce, and study them say for six or eight months."

COMMERCIAL GEOGRAPHY AND STATISTICS.

THE COAL PRODUCTION OF THE EARTH IN 1894-96.—The total coal production in 1894 was 554,948,000 tons; 1895, 585,319,000 tons; 1896, 600,105,000 tons. Here are the figures for the three greatest coal-producing countries:

	1894.	1895.	1896.
England.....	191,290,000	192,696,000	198,487,000
United States....	154,887,000	175,185,000	173,000,000
Germany.....	98,806,000	103,958,000	112,438,000

The coal production in the United States in 1897 was 198,257,000 tons. Of this amount Pennsylvania supplied by far the greater portion, 106,000,000 tons, or about 54 per cent. of the whole, 52,000,000 tons being anthracite. The next most important coal-producing States were Illinois, with 20,000,000 tons; West Virginia, 13,500,000 tons, and Ohio, with 12,000 000 tons. Alabama produced 5,900,000, and the smallest amount, 495 tons, was contributed by Nebraska.

THE INCREASE IN THE POPULATION OF EUROPE.—*L'Economiste* has an article on the growth of the population of Europe and its States in the decade 1887-97. The total population of Europe at the end of 1887 was 343 millions, and at the end of 1897, 379.7 millions, an increase of 36.7 millions, or 10.3 per cent. increase for the ten years, or 1.03 per cent. for each year. In 1887, 35 persons, on an average, lived in each square kilometre, and in 1897, 39 persons, or an increase in density in population in ten years of 4 persons to the square kilometre. The most densely peopled coun-

tries are Belgium, 200 to the square kilometre; the Netherlands, 133; Great Britain, 118; Italy, 104; Germany, 87; France, 72, and Switzerland, 71. Russia made the largest increase in the decade, 17.4 per cent., with 103.6 millions inhabitants in her European domain. Russia, however, Norway, Finland and Sweden are the States of lowest density of population.

COFFEE IN THE UNITED STATES.—The United States is the largest buyer of coffee. It consumes one-half of the total production, which is about 1,600,000,000 pounds a year. Since 1890, the importations of coffee into this country have averaged in value about \$90,000,000 a year, two-thirds of which comes from Brazil. Porto Rico and the Hawaiian Islands, however, are very favorably situated for coffee culture, and our new colonies are likely to supply a considerable part of the demand.

THE POPULATION OF JAPAN.—*Le Résumé Statistique de l'Empire du Japon* says the population of that empire is increasing with wonderful rapidity. It has grown from 38,000,000 in 1888 to 42,270,620 in 1895; due wholly to excess of births. The annual death rate is twenty to the thousand.

THE CARAVAN TRADE OF TRIPOLI.—Malta, the distributing point for goods destined to the Mediterranean nations, is reached by steamer from Tripoli in fifteen hours. The coast line of Tripoli measures 1,200 miles and it has many excellent natural harbors. The country, however, is still closed against the introduction of higher civilization. Much of the soil is rich and would yield a variety of valuable crops, but the Government adheres to the policy of excluding foreign enterprise. Tripoli is the chief gateway for traffic with the interior of Africa. The starting points of caravans, Tripoli, Khoms and Benghazi, are 200 miles nearer the Sudan than Oran, Algiers, Philippeville or Tunis. Even the railroads that now connect Oran and Philippeville with Ain-Sefra and Biskra cannot compete with Tripoli's routes. Through its depots for goods in the interior at Ghadames, Ghat, Murzuk and Aujila and its merchant houses familiar for generations with the demands and tastes of the Sudanese, Tripoli is more closely connected than any other north African territory with Central Africa. Fezzan, Jofra, Aujila, Jalo and Kufra are so many resting places for caravans. The Sudan from and including Baghirmi to the Niger depend upon Tripoli for their imports. The most important routes are those radiating from Ghadames.

The desert tribes afford protection to the caravans in return for regular stipulated payments. The caravan trade is entirely wholesale. Business houses of Tripoli have agents in the markets of the interior. European goods are delivered to these agents on the outward journey, and the produce of the districts is received by the caravans on the return journey. Open markets for the consumer are never held by the caravans in the Sahara and its oases, and very seldom in the Sudan. The retail trade is exclusively in the hands of the agents or dealers in the market towns.

The size of a caravan is from 100 to 1,000 camels. The caravan's arrival is announced a day or two in advance by a man on a riding camel, so that the dealers may have time to collect wares for barter. There are fixed rates for barter, and fresh camels may be hired at the chief centres in the desert. The goods are bought by the payment of cash or more frequently by barter. The goods consist of cotton and woollen cloths chiefly, besides red burnouses, beads, silk, amber, paper, drugs and tea. The chief goods received from the Sudan are ivory, ostrich feathers and hides, with some gold dust, india rubber, indigo, sulphur and medicinal plants.—(Dr. L. H. Grothe, *Deutsche Blätter*, Bd. XXI, Heft 2.)

The report of the British vice-consul on the trade of Tripoli for 1897 says that the estimated value of Sudan products received there in that year was \$460,000.

THE TIN PLATE INDUSTRY.—By tin plate is meant a sheet of iron or steel varying in thickness from 22 to 30 wire gauge and coated with tin. The plates to be covered with tin are in several sizes, but the standard is 14 by 20 inches. The tin comes from several sources, of which the best are in Australia and the Straits Settlements. The latter furnish the most desirable tin, known as Banca tin. This is regarded as the purest, and is in consequence more sought after by the manufacturer of tin plate. For twelve centuries the Cornwall mines in England, which were discovered about 55 B. C., were the only source of this mineral. In 1240 tin was found in Bohemia. Five hundred years later, in 1760, the Banca mines were opened. In this century, Australia became a producer of block tin on a large scale. From 1872 tin was found in commercial quantities in New South Wales, Queensland and Tasmania. Tin has been found in several parts of the United States, but in no sense can this country be regarded as a producer of tin. The United States has always been a large consumer of tin plate. In 1892 this country took 60 per cent. of the English pro-

duction of the commodity. In recent years a remarkable falling off in the imports has occurred, owing to the tariff upon imported tin plate, the demand for the article now being largely supplied by American industry.—(*The Yale Review*, No. 3, 1898.)

COMMERCIAL SCHOOLS.—The increased attention that is being given to the study of commercial geography is shown by the text books now preparing in this country, France and Germany, in which special attention is given to the commercial feature. Chicago is to have a commercial high school with a course extending over several years, in which large attention will be paid to commercial geography. The Diet of Japan has this year passed a bill for intermediate commercial schools throughout the empire. Signor Ferdinando Bocconi has placed at the disposal of the Milan Polytechnic \$80,000 for the establishment of an "Istituto superiore di commercio," or Commercial University, to be situated near the Polytechnic. It will aim to train traders of the first rank, and will give a diploma for proficiency in the study of the economic conditions and languages of the leading countries, chemistry, commodities, commercial geography, commercial, industrial and maritime law, customs and railroad legislation, banking, insurance and business methods.

WASHINGTON LETTER.

WASHINGTON, D. C., DECEMBER 15, 1898.

WATERWAYS.—The abandonment of the Pennsylvania canals leading from the coal region, the rumored sale of the Chesapeake and Ohio Canal, and the giving up of the waterway across the Delaware-Maryland Peninsula, are coincident with the active discussion of the feasibility of deep waterways from the Lakes to the sea, and of the great interoceanic lines at Nicaragua and Panama. On one hand is the general recognition of the present unprofitable character of those arteries of commerce which a half century ago were the foundation of commercial success, and on the other the appreciation of the vital importance of waterways capable of floating the modern large merchant vessels. The tendency to wholesaling and to concentration is thus exhibited in the fact that small canal boats and small canals do not pay, while large waterways are desirable at almost any cost.

The report of the Nicaragua Canal Commission of the Department of State has not yet been presented to Congress, but enough is apparently known to the friends of the canal to justify their activity in pressing forward the superiority of this project over that at Panama. There appears to be no question but that a canal must be built at an early date. In the same manner the advocates of the improvement of internal commerce are urging the extension of the system of movable dams on the Ohio River to provide slack water navigation in times of drought. It has been pointed out that the commerce on this river already far exceeds in tonnage that of the main Mississippi and its other tributaries. The supporters of the project of a ship canal between the Ohio River and the Great Lakes have been somewhat set back but not wholly discouraged by the recent speech of Mr. Andrew Carnegie before the Pittsburg Chamber of Commerce, in which he points out that he was among the first to suggest that a deeper canal should lead from the waters of Lake Erie to the Ohio. Since then conditions have changed and his present opinion is that if we had a ship canal 15 feet in depth the lake steamers would not come to Pittsburg. He stated that he did not wish to appear even by silence to be considered a party to any attempt to entice private capital to invest in building a canal between Pittsburg and the Lakes, because he is convinced that this capital would be entirely lost.

On the more northern project of deep waterways through New York the engineers are continuing surveys, but have not as yet made their report. They are obtaining a valuable body of geographic information, particularly concerning the volume of the rivers and the height and character of the divides between prominent drainage basins.

NAVIGABILITY OF THE RIO GRANDE.—The importance of exact geographic knowledge is well illustrated by the case now pending before the Supreme Court involving the question of navigability of the Rio Grande, particularly in that part of the river north of El Paso. Although the location of this stream is so well known on account of its forming the greater part of the boundary line between the United States and the Republic of Mexico, yet it is curious to note the erroneous conceptions popularly held concerning this stream. The scholar in the public school of the East who has seen a river like the Connecticut, Hudson, Delaware, or Susquehanna, probably pictures the Rio Grande as having a volume as large or larger than these, especially when on the map of the United States he sees its great extent from the mountains of central Colorado down through New Mexico along Texas to the Gulf. He is surprised and incredulous when told that at points above the middle of this course the waters have diminished to such an extent that the bed becomes nearly or quite dry, and that for months at a time the thirsty travellers may drive along or across the channel of this great stream hunting for water, not knowing even that they have passed beyond the river.

These facts are not often given in school geographies or even in more pretentious works, and the efforts of advocates to prove or disprove the navigability of the stream have demonstrated at least how little has been recorded concerning this great drainage system.

As a safe and permanent boundary between the two nations, the Rio Grande cannot be considered a success. Its bed—dry for miles through many months of the year—may be filled by the impetuous torrent which, checked by the mud and *débris* carried on its flood wave, cuts new channels, leaving many square miles of Mexican territory on the north of the deepest channel, or cutting off the communication of Texas ranchers from their native State. The torrents subsiding, the water gradually disappears, leaving wreckage along its course and a train of interminable controversies as to whether this piece of land or that is in Texas or in Mexico.

Navigation on a part at least of the Rio Grande is confined dur-

ing much of the year to "prairie schooners" * or similar vehicles. The Supreme Court of New Mexico announced that it is perfectly clear that the Rio Grande above El Paso has never been used as a navigable stream and that it is not now capable of being so used, more especially since dams have been erected and maintained at El Paso for nearly two hundred years, by which water has been taken out for irrigation on both sides of the stream. Nevertheless, this question of navigability, with other technical points, has been a matter of legal argument.

There is one point which perhaps appeals more to geographers than to the legal mind, and that is, that the main stream of the Rio Grande has been ignored in applying the name, as in the case of the Mississippi. With the latter it is often held that the name Mississippi should be applied to the Missouri and not to the part of the river from above St. Louis to St. Paul. With the Rio Grande the conditions are reversed; the main stream, if we consider volume of flow and geographic course, is really the Pecos, while that part above the mouth of the Pecos is to a certain extent an intermittent tributary, whose flow has only an occasional influence upon the trunk stream. This fact has been pointed out by Mr. R. T. Hill, who classes the upper Rio Grande with the innumerable lost rivers of the interior which, rising in the mountains, gradually lose their waters in the lower deserts. The Rio Grande belongs to this type, with the exception that it has cut through several desert ranges and at flood times contributes its waters to those flowing from the Pecos.

FLUCTUATIONS OF THE MISSISSIPPI.—The floods and low water of the Mississippi River are the resultant of forces distributed over the vast area of one and a quarter million square miles. The main stream may be regarded as a delicate instrument which in its pulsations responds to impulses given hundreds of miles away. The play of these forces has been beautifully described in a recent paper by Mr. James L. Greenleaf. He dwells upon the silent forces in the sunshine, air and water, which are continually at work with bewildering complexity, as shown by the rising and falling stream whose sensitive surface is the infallible recorder of them all. Taking a large view of the subject, he shows that throughout the year there are two waves of intensity which sweep across the great basin of the Mississippi from south to north. In the autumn all of the rivers have a tendency to reach the lowest point, and all begin to

* A popular name for the waggon used on the great plains.

rise toward the latter part of the winter. The increased flow is first shown in the southern rivers in January, and creeping northward the accumulation of waters is shown by the higher stages of the Ohio in late January and the Missouri and upper Mississippi in February, resulting often in the disastrous floods of this latter month. This early flood is due to the gradual increase of temperature, broadening from the Gulf toward the upper headwaters. The great bulk of the water comes from the southern half of the watershed, while yet the northern streams are locked in ice.

The high water thus produced by this temperature wave is often prolonged until the time when the rivers are again caused to rise by a similar wave of effective rainfall, which also seems to sweep across the country. Starting from the Gulf in late winter it travels slowly northward, climbing the plains to the western mountains. It has followed and lagged behind the earlier wave of melting, sometimes overtaking it, with disastrous effects to the low lands.

The subject of the floods of the Mississippi is now under investigation by a special committee of the Senate, and is exhaustively treated in volumes of evidence from citizens and experts in various lines. The point of greatest geographic interest probably is that the disastrous floods from the lower river occur at times when the headwaters in the Rocky Mountain region have not yet felt the influence of the advancing wave of temperature. These upper streams do not begin to swell until the high floods of the lower river have passed away, and their influence in prolonging the boating stage is therefore rather for good than for evil.

BASINS OF THE PLAINS.—The High Plains of the West, lying well within the semi-arid region, are popularly known to have an almost perfectly level surface. Careful examination of this surface shows it to be covered with shallow basins, varying from those two to three feet in depth and with breadth twenty times as great up to those with a depth of nearly one hundred feet and a breadth of one or two miles. This remarkable condition has been described by Mr. Willard D. Johnson in a report as yet unpublished, and the origin of the remarkable features is discussed at length. He points out that the forces at work are probably those present elsewhere, but that their effects are masked or concealed by the erosion of more humid regions. These depressions, or basins, may be caused by unequal subsidence of the stream-built sands and gravels which form the plains, such as might occur through a slight rearrangement of the particles by percolating water, or they may be

due to actual removal by solution of particles, causing channels which when enlarged are broken by the weight of the overlying earth. Where the depressions are in the form of pits or funnels, there is little doubt but that sudden subsidence into caverns has taken place, but on the other hand Mr. Johnson has become satisfied that most of the depressions are of gradual growth, and that even in the majority of cases the so-called "buffalo wallows" are in their initial stage shallow saucer-like depressions, originating from gradual solution or removal of material lying within a few feet under the surface. Buffalo doubtless wallowed in such hollows, as water would necessarily collect there after subsidence had begun.

The most remarkable case of subsidence is that of a sink-hole which originated suddenly in March, 1879, near the town of Meade, in southwestern Kansas. There had been an old road directly across the site, and over this a waggon had passed on March 3. Returning 23 days later a deep, sharp-edged pit was encountered about 175 feet across. It is now oval in form, 215 feet in greatest diameter. Cracks of roughly concentric form surround the pit, the dimensions of the area thus affected being 525 by 375 feet. The depth in 1879 was stated to be 89 feet, but through the slipping in of the banks the depth has decreased to 54 feet. When first noted the water was 75 feet in depth, being higher than the adjacent water level. This is probably due to the fact that the roof fell into a cavern full of salt water, displacing this, and that later the water gradually percolated away until it reached the level of the surrounding saturated area. There is no salt in the adjacent ground water, but the underlying Red Beds are intensely saline. This is shown by a test well sunk on the rim of the pit, in which impure rock salt was found at a depth of 325 feet.

One of the most curious phenomena in connection with this pool is the occasional high temperature at the bottom. The surrounding ground water remains constantly at 59° F. The surface water in the salt pit has a varying temperature, as might be expected, since it is exposed to the sun. On one occasion when the surface temperature stood at 89° F. the bottom temperature was found to be 156° F., the water being apparently stratified according to density. Thus a swimmer on the surface of the water enjoys a comfortable temperature, but on assuming an erect position his feet will be almost scalded. After several cloudy days the temperature at the bottom of the pool fell to 98° F. and at the surface to 76° F. The extraordinary range of heat at the bottom of this salt

pool led to the sinking of the test well, above noted, on its margin. In this the temperature of the rocks was found to be normal, the increase from surface to bottom being only about 11° F. in 325 feet.

FORESTRY.—The annual meeting of the American Forestry Association was held in Washington on December 14, 1898. Hon. James Wilson, Secretary of Agriculture, was elected President, and Dr. B. E. Fernow, of Cornell University, Vice-President. Mr. Gifford Pinchot, of New York, who recently succeeded Dr. Fernow as Chief of the Division of Forestry, was elected Chairman of the Board of Directors of the Association.

This meeting marks the end of the sixteenth year of active work and agitation on behalf of a rational and businesslike conservation of the forest resources of the country. It has been a year full of results, some of which, coming after many years of weary effort, have been a matter of surprise to the friends of the forestry movement. At the beginning of the year a determined attempt was made by Western politicians to throw open the reserves and to undo all that had been accomplished. When it was found that public sentiment was too strong to permit this and that some form of protection of the public forests was proposed, the opposition suddenly vanished and in its place came importunities for new reservations, or in other words new offices to be filled, the new places not being within the classified civil service. A year ago foresters feared that all reserves would be abolished; now they have reason to guard against the too hasty creation of new reservations.

N.

SEVENTH INTERNATIONAL GEOGRAPHICAL CONGRESS,
BERLIN, 1899.

90 ZIMMERSTRASSE, BERLIN S. W., NOVEMBER, 1898.

The Sixth International Geographical Congress, held at London, has, by a resolution unanimously passed on August 3d, 1895, accepted the invitation of its German members to hold its next meeting at Berlin in 1899.

The Geographical Society of Berlin (Gesellschaft für Erdkunde zu Berlin), which is assisted by a General German Council, considers it its honorary task to carry into effect this resolution, and herewith cordially invites the friends and promoters of geography in all countries, and especially the members of all geographical societies and cognate scientific bodies or institutes, to assemble at the German Capital for the meeting of the Seventh International Geographical Congress.

The meeting of the Congress will take place from Thursday, September 28th, to Wednesday, October 4th, 1899. Before the beginning and after the close of the Congress, excursions will be arranged through such parts of Germany as may be of interest with regard to physical or economic geography. There is particularly contemplated on the part of the Geographical Society of Hamburg an invitation to visit that city under the auspices and with the sanction of the Senate of the Free and Hanse Town of Hamburg.

Communications respecting the fuller organization and the general programme of the Congress will be despatched as early as possible.

The subjects which may be treated or discussed at the Congress are embraced in the following groups:

1. Mathematical geography, Geodesy, Cartography, Geophysics;
2. Physical geography (Geomorphology, Oceanology, Climatology);
3. Biological geography;
4. Industrial and commercial geography;
5. Ethnology;
6. Topical geography, exploring travels;
7. History of geography and of cartography;
8. Methodology, school geography, bibliography, orthography of geographical names.

An exhibition will not be arranged on the part of the Congress. If any private exhibitions should be instituted, notice will be given hereafter.

The membership of gentlemen and ladies is acquired by payment of 20 marks (one pound or 25 francs). Members will receive all publications of the Congress free of charge. Ladies accompanying members are also admitted as Associates against payment of 10 marks (10 shillings or 12½ francs), but in this quality will have no right of vote and will not receive all the publications gratuitously; in all other respects they have the rights of Members.

Intending Members and Associates are particularly requested to intimate their intention on the annexed form as soon as possible, in order that their names and addresses may be registered and all subsequent communications concerning the Congress may be sent to them.

Subscriptions may be paid in advance. As soon as the money is received, a ticket for the meetings of the Congress will be sent to the subscriber. No person will be admitted to any meeting or social gathering without a ticket.

All those who desire to propose to the Congress the treatment of certain tasks or problems, or who wish to communicate results of exploration, or who intend to read papers on subjects of general and enduring interest, are requested to give notification thereof before April 1st, 1899, and to send their manuscripts ready for print not later than June 1st, 1899. The time allowed for each discourse or paper shall, as a rule, not exceed twenty minutes, but exceptions may be granted by the Presidency for subjects of general interest or importance.

According to preceding usage the English, French, German and Italian languages are admitted as languages of the Congress, and all papers must be written in one of them.

All propositions, applications, notifications and manuscripts of papers, which are addressed in due time to the Congress, will be submitted for examination to a special committee, and, if found suitable, incorporated in the general programme, so far as the time at disposal shall allow. If it is desired that full notice of any communication thus admitted be given in the daily bulletin, which is to be published during the meeting, an abstract of it, not exceeding 1,500 words, must be delivered before August 1st.

Any motion to be laid before the Congress must be formulated in writing and should be transmitted not later than June 1st, 1899.

All correspondence relating to matters of the Congress is to be addressed

*To the VII. International Geographical Congress,
90 Zimmerstrasse, Berlin S. W.*

Remittances are to be addressed

*To the Treasurer of the VII. International Geographical Congress,
Herrn H. Bülow,
90 Zimmerstrasse, Berlin S. W.*

THE GEOGRAPHICAL SOCIETY OF BERLIN.

GEORGE KOLLM,
Secretary General.

F. BARON VON RICHTHOFEN,
President

FORM OF APPLICATION.

*To the Seventh International Geographical Congress, 90 Zimmerstrasse,
Berlin S. W. :*

The undersigned herewith applies for his inscription as a Member of the Seventh International Geographical Congress, and engages himself for the contribution of 20 marks (or one pound or 25 francs).

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MAP NOTICES.

BY

HENRY GANNETT.

Since the last notice, the United States Geological Survey has issued fourteen additional sheets of the topographic atlas of the country.

One only of these, Hempstead, is in New York. This, on a scale of 1:62,500, with a contour interval of 20 feet, is on the south shore of Long Island, southeast of Brooklyn, and represents an area sloping gently from the glacial hills of the interior to the coast marshes, which, in time, are partially protected from the sea by sand-bars.

Lying mainly in Maryland, but projecting slightly into adjacent States, are three sheets, Elkton, St. Mary and Frostburg. The first is upon a scale of 1:62,500, with contour intervals of 20 feet. It represents an area of low, rolling hills near the head of Chesapeake Bay.

The second, St. Mary, on a scale of 1:125,000, with a contour interval of 20 feet, represents the Bay and its shores northward from the mouth of Potomac River, a sinking land, with broad estuaries, the country rising on the west little more than 100 feet above the sea, while on the eastern shore it is all less than 20 feet, and most of the area is marsh.

The third sheet, on a scale of 1:62,500, with the same contour interval, shows an entirely different country. The Allegheny Front, here a cliff 2,200 feet high, crosses it from the northeast to the southwest corner. East of it are parallel ridges and valleys, the typical Appalachian structure, while west of it the country soon assumes the well-known aspect of the Allegheny plateau, a dissected plateau, with irregular drainage lines.

The region about Omaha and Council Bluffs is represented by a sheet entitled "Omaha and Vicinity." This is on a scale of 1:62,500, with a contour interval of 20 feet. The Missouri River traverses the area from north to south in a bottom-land varying from three to six miles in breadth, beneath bluffs 300 feet in height. It is joined by the Platte near the south margin of the region. The Missouri winds in broad curves through its bottom-lands, from bluff to bluff. Its frequent changes of course are shown by the numerous crescent-shaped lakes which dot the bottom-land. Four other sheets repre-

sent areas in Nebraska, York, Hebron, Superior and Scotts Bluff. The first three are near the middle of the State, and represent prairie lands, with little relief. The fourth is in the western part and shows a part of the valley of North Platte River, with Bad Land bluffs, 600 to 800 feet high, limiting it on the south.

In South Dakota are two sheets, Huron and Olivet, on a scale of 1:125,000, with a contour interval of 20 feet. These show part of James River Valley, a country of trifling, but irregular, relief, produced by glacial deposits. Across them flows James River in a narrow channel, 40 to 60 feet only in depth. The stream courses are few, and are but slightly cut below the level of the plain. It is evident that this region is in its infancy.

In Wyoming is one sheet, Sundance, on a scale of 1:125,000, with a contour interval of 50 feet. This includes the northwest portion of the Black Hills which are shown on the eastern part of the sheet, and part of the Bear Lodge mountains, in the northwest corner. Upon this sheet is a fine example of a volcanic neck, in the mountain known as Inyankara.

In California is one sheet, Dardanelles, on a scale of 1:125,000, with a contour interval of 100 feet. This represents an area in the high Sierra, the eastern portion of which has been heavily glaciated, and now presents a broken surface, with many sharp peaks, amphitheatres, and lakes. In the western portion the streams have cut heavy cañons in their descent from the higher mountains to the San Joaquin valley.

In Washington is one sheet, Mt. Stuart, representing an area on the eastern slope of the Cascade Range. It is on a scale of 1:125,000, with a contour interval of 100 feet. In the southern part is the broad valley of Yakima River, while the northern part is occupied by the rugged granite peaks and spurs of the Range.

The map of the United States, edition of 1898, just issued by the General Land Office, corrects a serious error committed in earlier editions, that of including the territory of Oregon in the Louisiana purchase. There was absolutely no excuse for this blunder, for the western limit of Louisiana has, for many years, been well established, but none the less we congratulate the Land Office on the correction.

The distribution and migrations of the American and Asiatic fur seal herds are shown most admirably on a map prepared by Mr. C. H. Townsend, of the U. S. Fish Commission. The two herds are entirely distinct in their habitat and range, the American having its home on the Pribilof Islands, and its winter range extending

down the Pacific coast nearly to San Diego, following the coast closely. The Asiatic herd, with its home on the Komandorski Islands, ranges in winter and spring down the Asiatic coast, nearly as far south as Yokohama.

The United States Geological Survey has issued in connection with Bulletin 154 (Gazetteer of Kansas), a map of Kansas, on a scale of 1:750,000, about 12 miles to 1 inch, on which the relief is expressed by contours of 100 feet. It is compiled in the main from the detailed atlas sheets. As exhibiting the broad features of a portion of the Great Plains this map is of much interest.

The *Geographical Journal* for June, 1898, contains a sketch map of southern Tunis, illustrating Sir Harry H. Johnston's journeys, scale about 40 miles to 1 inch, relief expressed by brown shading; also a map of a portion of British Central Africa, west of the Loangwa River, from a sketch survey by Cyril D. Hoste; scale 1:1,000,000, relief by brown shading; a sketch map of Lob Nor and the Lower Tarim River, from a survey by T. K. Kozloff, and a map of Northeast Nicaragua, from a survey by John M. Nicol; scale 1:1,500,000, relief expressed by hachures.

The *Geographical Journal* for October, 1898, contains several maps worthy of notice: (1) a sketch map of Tirah and surrounding country, scale 1:250,000, shaded relief, published to illustrate a paper by Sir T. H. Holdich; (2) Kavirondo, East Africa, scale 1,500,000, drainage and sketch contours, with routes of exploration, accompanying an article by Mr. C. W. Hobley; (3) a railway map of the Argentine Republic and Chile, scale 80 miles to an inch, and (4) a relief map of Chile and the Argentine Republic, scale 1:20,000,000, relief shown by three shades of brown. Both maps (3 and 4) illustrate Col. Church's paper on Argentine geography.

The *Scottish Geographical Magazine* for June contains a map of Armenia and Kurdistan, showing distribution of native tribes, to illustrate an article by Mr. Victor Dingelstedt.

The *Scottish Geographical Magazine* for July contains a map of western Canada, showing routes of travel to the Klondike district, to accompany a paper by Mr. Wm. Ogilvie, scale about 100 miles to 1 inch. Also, in the same number, a series of four maps of Europe, representing various stages in the glaciation of that grand division.

Bulletin No. 10 of the Biological Survey, Department of Agriculture, contains as its frontispiece a small map of the United States, with adjacent parts of Canada and Mexico, representing the life zones of the country. They are classified as Boreal, Transition,

Upper Austral, Lower Austral, Gulf strip of Lower Austral and Tropical. These are subdivided as humid and arid.

The conformity of these zones to altitude and latitude, or, to sum it up, with temperature, is close, and yet examination of details shows notable departures. The Boreal zone is represented only in Canada, along our northern border and upon the higher of the Cordilleras; the Tropical zone only in southern Florida, southern Texas, the lower valley of the Colorado, and along the Mexican coast. The map is an instructive generalization.

Istituto Cartografico Italiano. Atlante Scolastico per la Geografia Fisica e Politica di Giuseppe Pennesi, Roma, 1898.

This physical and political atlas contains 50 plates, 5 of which are devoted to the earth as a whole, representing the relief, ocean currents, the elements of climate, the distribution of vegetation, population and religions. These are followed by physical and political maps of countries, of which Italy naturally claims the greater proportion of space.

The maps are beautifully engraved and printed, and the atlas is a very useful one for giving broad conceptions of the different classes of facts therein depicted. It is lamentable that American publishers cannot be induced to make similar atlases, giving corresponding prominence to our own country.

H. G.

SENH. ERNESTO DE VASCONCELLOS publishes in the *Revista Portuguesa Colonial e Maritima* of November a photogravure of an old map of Mombasa. In the margins of the plan is a description of the island, its capture and its restoration in 1728, which is approximately the date of the map. The reproduction is half the size of the original, which is drawn in colors, to the scale of half an Italian mile, of 60 to the degree. The water is colored greenish and shaded, and the fortifications are traced in carmine.

A comparison of the map with the recent Admiralty Chart of Mombasa shows only a few changes in outline, the natural result of the action of the water.

The most marked differences are in the breadth and the direction of the two streams, the Druma and the Arabaia, which enter the sea at the north end of the island.

G. C. H.

BOOK NOTICES.

Rivers of North America: A Reading Lesson for Students of Geography and Geology; I. C. Russell. G. P. Putnam's Sons, 1898. pp. xix + 327. \$2.00.

The fourth monograph dealing with the physical geography of North America that has just appeared from the pen of Prof. I. C. Russell is a handsome and very welcome volume, and by far the most important of the series. Up to this time we have had no popular or easily accessible consideration of the phenomena of rivers from the modern standpoint. All the adequate treatments, even for beginners in the science of geomorphology, have been in scientific periodicals, in part out of print. Prof. Russell has practically given us a text-book on the development of land forms, with particular reference to the work of rivers in North America, and has presented his facts in a well ordered and attractive way. The book is more inclusive, of more general value, and capable of broader usage than the title would indicate.

After a short introduction, the author considers the following large topics in separate chapters: The Disintegration and Decay of Rocks; Laws Governing the Streams; Influence of Inequality in the Hardness of Rocks on Riverside Scenery; Material Carried by Streams in Suspension and in Solution; Stream Deposits; Stream Terraces; Stream Development; Some of the Characteristics of American Rivers; The Life History of a River.

In Chapter II. we find a good treatment of the power and results of stream work, and a helpful consideration of peneplains and base-level of erosion. Chapter IV. considers in detail the complex problem of the loads of streams and degradation, particularly in reference to rate, both mechanically and chemically.

The last chapters are devoted more fully to the forms of land or waste due to river work. Alluvial cones, flood plains, deltas and terraces are treated fully as to origin, classification, and distribution. Many illustrative examples are mentioned, and references to literature are quoted.

Perhaps the most interesting chapter for a student of geomorphology is that on Stream Development. Here we have a well digested and very clear account of the development of consequent and subsequent streams on the more common land forms. Particular reference is made to the rivers of the Appalachians, and to

the details of river history which have been worked out in this region by our American geologists. We find the recently introduced and very helpful terms descriptive of different features of drainage, used in such a way that the beginner finds here the best available statements of the more necessary definitions. It should be stated further that the author has not included every term that has been suggested in the last few years, but only those which have appealed to others than the inventors, and which fill a need in our terminology.

The following chapter is devoted to a more concise account of our chief American rivers, given in such a form that it will be of help to the general reader and teacher, and should be much used for reference.

The last chapter is one of those mind-broadening considerations of earth forms and processes, from the earth rather than the human standpoint, that we have come to expect as the climax in Prof. Russell's monographs. The reader of this chapter should find himself becoming more and more in sympathy with the world about him, and more and more awakened to the pleasures of a scientific study of the earth and its relations to man.

The book is pleasing to the eye as to its form and typography, and well indexed. Our great regret is that the four monographs, dealing with the Lakes, Glaciers, Volcanoes and Rivers of North America are not uniform in appearance. Were they all printed after the manner of the last, they would form a library series as pleasing to the librarian as to the student of geography.

R. E. D.

Leçons de Géographie Physique; A. De Lapparent, 2^{me} Edition: Masson, Paris, 1898. pp. xvi + 718.

The very helpful *Leçons de Géographie* of Prof. De Lapparent has been so well received, and proved itself so useful, that a new edition has been issued in about two years from the date of the first. The book in question is indeed a *new* edition, for the author has rewritten and amplified his former contribution very extensively. Two new chapters, one on the ocean and one on the classification of mountains, have been added, and the illustrations have been enriched by some 46 new cuts.

M. Emm. de Margerie has assisted in the work, and has made good use of his marvellous acquaintance with current geographic literature. It is undoubtedly due largely to his work that we owe so many references to Suess's *La Face de la Terre*. Indeed, the

references throughout the book are ample, modern and very well selected.

The introductory chapters, devoted to the origin and development of land forms, and treating of the work of the various constructive agencies, have nearly all been somewhat amplified and brought up to date. The greatest differences between the old and the new are found in the chapters devoted to what may be called Regional Geomorphology. In no part is the improvement and enrichment more noticeable than in the two chapters devoted to North America. The arrangement and treatment is here very new and satisfactory. We find a very adequate and helpful analysis of the features of North America, and particularly the United States, that has been made with the most modern results of American geographers in hand. The text here is helped by a number of well chosen plates, that are of service to an American as well as to a European reader. With Suess's *La Face de la Terre* as a collateral help, the student of comparative geomorphology has in this book a very ready source of reference. The more than 100 pages added to the first edition are a welcome and satisfactory addendum that make the book much more serviceable.

Perhaps the most pleasing feature to note is that while in America, the birthplace of so much that has had an important influence on the geographic thought of the world in the last few years, we are still without a manual in geomorphology, our French colleagues have not only produced a manual of great value, but have been obliged to have a reissue. We commend the spirit and work of our friends across the water, particularly this latest evidence of geographic progress.

R. E. D.

Cuba and Porto Rico, with the other Islands of the West Indies, their Topography, Climate, Flora, Products, Industries, Cities, People, Political Conditions, etc. By Robert T. Hill, of the U. S. Geological Survey. New York, The Century Co., 1898. 8vo, pp. 28 + 408, with index. 81 illustrations.

This book is, as the title indicates, a geographic story of the West India Islands. It opens with a broad outline of the geography and oceanography of the Gulf of Mexico and Caribbean Sea, the American Mediterranean, as Mr. Hill aptly characterizes it, with its shores and islands. Taking up each of the larger islands in turn, he describes at length its coast, relief, rivers, valleys and plains, its climate and life, its population, government, industries and resources, the social condition of the people and its cities. To Cuba are devoted, in this way, 112 pages, to Porto Rico 40 pages,

to Jamaica 50 pages, and to Haiti 60 pages. The Lesser Antilles and the other smaller groups are of necessity treated more briefly. The work ends with chapters on "Geologic Features," "Race Problems," and the "Future of the West Indies."

Mr. Hill is a geographer, in the broadest and best sense. He has travelled extensively during the past 5 years in the region here described, studying its geology and geography, and the social and economic conditions of its inhabitants. As a result, we have in this book a masterly description of our new possessions and their neighbors, a live description born of the keen, sympathetic interest with which he has so recently studied them.

Not the least interesting part of the story is the great diversity of races found in these islands; the Spaniards, Cubans and blacks of Cuba, the mulattoes of San Domingo and the French-speaking negroes of Haiti, the blacks of Jamaica, with a slight sprinkling of English, and so on. The absence of intercommunication among these islands has led to curious phases of development or non-development of their peoples.

Regarding the Cubans Mr. Hill is optimistic, and many will not agree with him that the Cuban is of superior clay to his father, the Spaniard.

We regret to note the misspelling* of the name Puerto Rico in the title and throughout the book.

The dress of the book is pleasing; the print is excellent and the illustrations, half tones, are beyond criticism. H. G.

* *Porto Rico*, it seems proper to say, is the true English name for the island of Puerto Rico. It holds its ground by the same right as Spain, Saragossa, Brittany, Belgium, Germany, Italy, Vienna and thousands of other names. The U. S. Board on Geographic Names, constituted in 1890, has made the form *Puerto Rico* obligatory in Government publications, and the changed relation of the island to the United States will give some extension to the use of this official spelling; but the right English name will remain, and the people of this country, spell as they may, will continue to pronounce *Porto Rico*.

Mr. Hill's work is that of a right-minded and conscientious man, making a true report of what he has seen and studied. His good faith and modesty are evident, and the reader hesitates to hold him responsible for the maltreatment of words and names. Such forms as *Plaza des Armas* (p. 64), *Cape Maici* (p. 132), *la virazon* (p. 52), might seem to be mere slips; but *Taçon* (pp. 66, 71) and *El Junki* (p. 133) disturb the mind with doubt. If any name is well known in Cuba it is that of Tacon, and the cedilla is as foreign to modern Spanish as to English. Does any one write Andrew Jackson?

The name of the flat-topped hill near Baracoa is El Yunque (the anvil). To spell it *El Junki* is to make an impossible Spanish word.

In the second edition, which must be called for, these faults should be corrected.

—EDITOR BULLETIN.

Madagascar, Homère et la Civilisation Mycénienne. François du Mesnil, Ingénieur Colonial. Deuxième Édition. Paris, Librairie Ch. Delagrave. (1898.)

M. du Mesnil adorns his title-page with a few words of soberness from Admiral Jurien de la Gravière. Considering the character of his book, he would have done better to quote Alfred de Musset:

Je suis venu trop tard dans un monde trop vieux.

A book that takes Ulysses to Madagascar, and derives the names of Timbuktu, Tchad, Tanganyika and Nyassa from the Greek, should have been written in the happy time when scholars identified the English, the Mexicans and the Iroquois with the children of the Lost Tribes. To M. du Mesnil the East is West and the West is East, and he finds no man to answer him:

The names of the peoples who inhabited America before Christopher Columbus all have a Greek turn: Caribs, Aztecs, Zapotecs, Quelenes, Tzendanes. Did not the name of the Incas come to them from the distance, with respect to Greece, of the place which they inhabited: Incas, *Ekas*, far, very far? (p. 162).

Die Reste der Germanen am Schwarzen Meere. Eine ethnologische Untersuchung von Dr. Richard Loewe. 8vo. Max Niemeyer. 1896. 8 mk.

Dr. Loewe makes five divisions of his subject: the Germans of Asia Minor, the Germans of the Caucasus, the Germans reported on the Caspian, the Crimean Goths, the Gothi Minores, or Lesser Goths.

Theophanes, in the 8th Century, mentions the *Gotthograikoi* as taking part in a mutiny of the Byzantine fleet under Anastasius II. They reappear, as Dr. Loewe believes, in the *Graikoi* of Constantine Porphyrogenitus, in the 10th century, and he regards them as descendants of the Goths, Heruli and other Germanic tribes, who invaded Asia Minor in the 3d century.

In the anonymous Periplus of the Euxine it is recorded that the Eudusiani, living on the northern coast (between the modern Anapa and Gelenjik) speak the Gothic and Tauric tongue. There is room for conjecture in the statement since, according to Karl Müller, the editor of the Periplus, the text of that work is a compilation from various writers, and it is not even certain whether the expression, *Gothic and Tauric tongue*, is to be understood of one and the same language, or of two languages spoken by one people.

The name Eudusia does not occur again, but Dr. Loewe accepts Vassilievski's identification of it with the region called by Procopius

Eulysia, extending to the east of the Palus Mæotis, up to the river Tanais.

The same historian places the Tetraxite Goths on the north-eastern coast of the Euxine as well as on the Cimmerian Bosphorus (Strait of Yenikale). The name Tetraxite is not of Germanic origin, and Dr. Loewe believes it to be a modification of *Tmutarakan*, often mentioned in the Russian Igor ballad, of the 12th century. In this ballad there is mention of Goths and Gothic maidens.

The earliest notice of the Crimean Gothic as a separate language is in the Slavic legend of St. Constantine, who betook himself to the Crimea in the latter half of the 9th century to preach Christianity. The Gothi, it is said in this legend, were among those who prayed in their own tongue.

The Fleming Rubruquis, who visited the Crimea in his pilgrimage, undertaken in 1253, noted there

many Goths, whose language is Teutonic.

The characteristics, which neither Greek nor Slav was in a position to recognize, naturally impressed the man of a kindred race.

Dr. Loewe quotes several other writers down to the time of Busbec, from whose *Epistolæ* (Paris, 1589) he takes an interesting passage, describing an interview with two Crimeans, the one taller, with a certain openness and simplicity in his face, so that he looked like a Fleming or a Dutchman: the other shorter and more compact of body and of dark complexion, a Greek by birth and speech

Busbec wrote down from the dictation of the second a number of the Gothic words in use in the Crimea, and many of these are indisputably Teutonic, and nearest in form to Anglo-Saxon.

In one passage Dr. Loewe speaks of himself as only a layman, but he has treated an obscure and difficult subject with thoroughness and learning and in a winning style.

In the Forbidden Land: An Account of a Journey into Tibet, Capture by the Tibetan Lamas and Soldiers, Imprisonment, Torture, and Ultimate Release Brought about by Dr. Wilson and the Political Peshkar Karak Sing-Pal. By A. Henry Savage Landor, with the Government Enquiry and Report, and other Official Documents by J. Larkin, Esq., deputed by the Government of India. With 1 Photogravure, 8 colored Plates, 50 Full-page and about 150 Text Illustrations, and a Map from Surveys by the Author. In two volumes. Harper and Brothers, Publishers, New York and London. 1899. 8vo.

Mr. Landor's preface says:

In this book I have set down the record of a journey in Tibet undertaken by me during the spring, summer and autumn of 1897. It is illustrated partly from my

photographs and partly from sketches made by me on the spot. Only as regards the torture scenes have I had to draw from memory, but it will be easily conceded that their impression must be vivid enough with me.

The map is my own, made entirely from my surveys of an area of twelve thousand five hundred square miles in Tibet proper. In Chapter VI. the altitudes of such high peaks in India as Nandi Devi and others are taken from the Trigonometrical Survey, and so are the positions fixed by astronomical observations of the starting and terminating points of my surveys at the spots where I entered and left Tibet.

According to the Government Report, signed by Magistrate Larkin, October 15, 1897 (Appendix, p. 217), Mr. Landor entered Tibet on the 13th of July, and was seized and bound by the Tibetans on the 20th of August.

The spring, summer and autumn journey was, therefore, a journey of a little more than five weeks in the summer of 1897. The time was short, but Mr. Landor made good use of it, not only in sketching and photographing, but in surveying and mapping an area of Tibet about equal to that of the Netherlands or the State of Maryland.

He submits, with deference, the following geographical results of his expedition:

The solution of the uncertainty regarding the division of the Mansarowar and Rakastal Lakes;

The ascent to so great an altitude as 22,000 feet, and the pictures of some of the great Himalayan glaciers;

The visit to and the fixing of the position of the two principal sources of the Brahmaputra, never before reached by a European;

The fact that with only two men I was able to travel for so long in the most populated part of Tibet.

Mr. Landor's solution of the uncertainty as to the lakes is that there is no connection between them.

Lieut.-General Sir Richard Strachey writes to *Nature*, of Nov. 24, that his brother, then Capt. Henry Strachey, crossed the stream that flows from Mānasarowar into Rakastāl and described it, in 1846, as about a hundred feet wide and three feet deep, running rapidly from east to west in a well-defined channel. In 1849 Lieut.-General Strachey himself saw the stream at the point where it leaves the lake, and there is no more doubt about the fact, he says, than that the Thames runs past Richmond.

Col. Sir T. H. Holdich writes, in the *Geographical Journal* for December (p. 588), that Mr. Landor has fallen into the inexcusable error of making a positive assertion about the physical conformation of the lake surroundings without having actually traversed the ground to which he refers.

Of the other results, so modestly claimed, it may be admitted

that it is something to reach an altitude of 22,000 feet and to take pictures of glaciers, as well as to travel with two companions in a more or less populous country. These feats are sometimes more interesting to the traveller who tells, than to those who read, his story, though they may be registered by courtesy as contributions to geography.

If Mr. Landor has really fixed the two principal sources of the Brahmaputra, he has done well; but it seems better to wait for more light on the subject.

Considered merely as a story of travel, *In the Forbidden Land* may be read with interest. It is fairly well written, and the account of the Tibetans has, except for some ghoulis tales, all the marks of truthfulness. They cannot be called an attractive people.

The most interesting portions of the book are the descriptions of scenery, the mountains, the snow-fields, the torrents bridged with ice, the plains and the mirage.

A great part of the second volume is taken up with the long-drawn details of Mr. Landor's capture, imprisonment and torture. It is not pleasant reading, and it might have been shortened with advantage. One obvious question remains without answer: why all this misery? Mr. Landor was warned, more than once, of the perils before him, and common sense refuses to admit the existence of a sufficient motive for his conduct. He was cruelly ill-treated; but he had no business where he was.

The illustrations, though too many of them are fanciful, are well brought out and the printing is good; but the paper could not well be worse. It is apparently loaded with clay and it splits, even when carefully handled.

The Annals of the Voyages of the Brothers Nicolò and Antonio Zeno in the North Atlantic about the End of the Fourteenth Century and the Claim founded thereon to a Venetian Discovery of America.—A Criticism and an Indictment.—By Fred. W. Lucas, Author of "Appendiculae Historicae" and part Editor of "The New Laws of The Indies." Illustrated by Fac-similes. London, Henry Stevens Son and Stiles, 39 Great Russell Street, over against the British Museum. MDCCC LXXXVIII. 4to.

Vivien de Saint Martin, in his *Histoire de la Géographie* (pp. 387-388), has this to say concerning the story and the map of the Zeni:

Nicolo Zeno, of a noble and rich family of Venice, had, like so many of his countrymen, the passion for travel to distant places. He fitted out a ship, and steered from Gibraltar to the north. A storm which overtook him in the English seas drove him very far to the higher latitudes; he was cast upon a land which he calls *Frisland*. The king (a Norwegian) received him kindly, kept him and gave him

the command of his fleet, which was numerous. Zeno remained there fourteen years, part of the time with one of his brothers who had come to join him. Nicolò wrote many letters to his third brother, who had remained in Venice.

Some of these letters, found at a later day in the family, have been published, together with a map, drawn by Nicolò himself, of the part of the Northern sea which extends above Scotland and west of Norway. Notwithstanding the incorrectness of direction and of position, the lands marked on this map are easily recognized. Above Scotland (*Scocia*) towards the northwest, is a large island, with the name of *Frisland*, which gave occasion formerly to so many erroneous suppositions and discussions; it is the group of the Faroe Islands, and the Venetian map presents moreover many details of denomination belonging to these. *Estland*, between Frisland and Norway, answers to the Shetland Isles. To the north of Frisland is Iceland, and above Iceland, to the north and west, appears Greenland, very well drawn under the form of a great mountainous peninsula, covered on its two coasts with names of streams and of capes, and designated by the double name of *Grolandia* and *Engronelant*. Finally, south of the point of Greenland, two islands, half hidden on the border, *Estotiland* and *Droceo*, evidently indicate the lands seen by Ericson and formerly described under the names of Helluland and Vinland. The document is explained by itself on inspection, and hardly required the academic erudition which has been expended upon it.

Mr. Lucas does not agree with this conclusion. He has devoted a vast amount of time and study and ingenuity to refutation of the arguments of those who are disposed to accept the Zeno story as an authentic record. His description of his work as a criticism and an indictment is exact, and, through no fault of his own, he leaves the main questions—whether the story is true and whether the map is to be accepted as genuine—still undetermined.

His own conclusions, somewhat condensed, are:

1. That, though Nicolò and Antonio Zeno may have visited Frislanda and written letters, the narrative was compiled by Nicolò the younger from the published works of others.
2. That the two accounts of Greenland are untrue and could not have been honestly written by persons who had visited it.
3. That there is no evidence that Antonio Zeno ever visited America.
4. That Columbus and Juan de la Cosa knew nothing of Frislanda.
5. That Frislanda had no real existence.
6. That Zichmni cannot be identified.
7. That the *Carta da Navegar* was made up from other maps.
8. That the Zeno story was compiled to gratify family pride and Venetian jealousy of other nations, by showing that Venetians had discovered America before the Genoese Columbus.
- 9 and 10. That Nicolò the younger was guilty of a successful imposture.

It must be acknowledged that these are not unreasonable conclusions; but they are not decisive; and the counsel for the defend-

ant, if there were one, could make an equally good showing. Nos. 1 and 7, for instance, assume too much. It is rash to conclude that original letters and maps do not exist, because they have not yet been produced.

The truth is that the evidence, whether for or against the Zeno story, is insufficient. The case must be left as it is.

Mr. Lucas's volume is admirably printed on excellent paper, and illustrated by eighteen maps and figures in the text and as many large reproductions at the end of the book.

Cave Regions of the Ozarks and Black Hills. By Luella Agnes Owen, *Membre titulaire de la Société de Spéléologie, and Fellow of the American Geographical Society.* Cincinnati. The Editor Publishing Co. 1898.

Miss Owen has visited the natural wonders of which she writes with an enthusiasm directed by study and knowledge.

The finest cavern of Missouri is Marble Cave, in Stone County. The entrance is through a large sink-hole in the top of Roark Mountain, and the descent over broken ground and by a wooden stairway lands the traveller at the Auditorium, the great chamber, thus described:

The blue-gray limestone walls have a greater charm than those of an open cañon, owing to the fact that they sweep away from any given point in long, true curves to form an elliptical chamber three hundred and fifty feet long by one hundred and twenty-five feet wide, with the vault above showing absolute perfection of arch, and measuring, by the survey, from its lowest to its highest point, one hundred and ninety-five feet . . . In addition to the artistic superiority of architectural form, its acoustic properties having been tested, it is found to be truly an auditorium.

The chief ornament of this hall is the White Throne, a mass of white and gold onyx, sixty-five feet in height and of about two hundred feet in circumference. Thirty feet behind the throne is a fluted column of onyx, about twenty feet high. This is known as the Spring Room Sentinel, because the Spring of Youth is just behind, being the first chamber on the left in Total Depravity Passage, a dangerous way of which next to nothing is known.

There is a commodity of names in the Ozark caves, but South Dakota is not easily outdone with its Saint's Rest, Cupid's Alcove and Chamber de Norcutt.

Miss Owen's conclusion as to the formation of the Dakota caves is that they are the result of geyser action, and that the conical or dome shape of some of the chambers is due to jets of water forced up from lower levels.

The illustrations present some very striking forms, and a map at p. 42 gives a clear impression of the extent of Marble Cave.

ACCESSIONS TO THE LIBRARY.

OCTOBER-DECEMBER, 1898.

BY PURCHASE.

L'Afrique Equatoriale, par le Dr. A. Poskin, Bruxelles (1898), 8vo; Madagascar, Homère et la Civilisation Mycénienne, par Fr. du Mesnil, Paris, 1898, 2^{me} Édition, 8vo; Introduction to the Study of North American Archaeology, by Cyrus Thomas, Cincinnati, 1898, 8vo; Through Romany Songland, by Laura Alexandrine Smith, London, 1889, 16mo; Historic and Monumental Rome, by Charles Isidore Hemans, London, 1874, 8vo; The Jesuit Relations and Allied Documents, edited by Reuben Gold Thwaites, Vols. XXIX-XXXIV, Cleveland, 1898, 8vo; History of the Catholic Church in the United States, 1843-1866, by John Gilmary Shea, New York, 1892, 8vo; The Sailor's Word-Book, by W. H. Smyth, London, 1867, 8vo; St. Paul, the Traveller and the Roman Citizen, by W. M. Ramsay, 4th edition, London, 1898; American Book-Prices Current, 1898, compiled by Luther S. Livingston, New York, 1898, 8vo; Proceedings of the Virginia Historical Society, Vol. XI, Richmond, 1892, 8vo; The Philippine Islands and their People, by Dean C. Worcester, New York, 1898, 8vo; Norway and the Norwegians, by C. F. Keary, London, 1896, 8vo; Sailing Directions of Henry Hudson, Introduction, etc., by B. F. De Costa, Albany, 1869, 8vo; Manuel de l'Explorateur, par E. Blim et M. Rollet de L'Isle, Paris, 1899, 8vo; In the Forbidden Land, by A. Henry Savage Landor, New York, 1899, 2 vols., 8vo; Emin Pasha, His Life and Work, by Georg Schweitzer, Westminster, 1898, 2 vols., 8vo; Yesterdays in the Philippines, by Joseph Earle Stevens, New York, 1898, 8vo; With Ski and Sledge over Arctic Glaciers, by Sir M. Conway, New York, 1898, 8vo; The American Democrat, by J. Fenimore Cooper, Cooperstown, 1838, 12mo; Things as they are in America, by W. Chambers, Philadelphia, 1854, 16mo; Insulinde, by Anna Forbes, Edinburgh, 1887, 8vo; Two Years Among the Savages of New Guinea, by W. D. Pitcairn, London, 1891, 8vo; The Boers in the Transvaal, 1880-81, by C. L. Norris-Newman, London (1882), 2d edition, 8vo; Journey to the Source of the River Oxus, by John Wood, new edition, London, 1872, 8vo; Private Life of Warren Hastings, by Sir Charles Lawson, London, 1895, 8vo; Les Actes des Apôtres Modernes: Voyages des Missionnaires Catholiques, Paris, 1852, 3 vols., 18mo; Belgium and Western Germany in 1833, by Mrs. Trollope, London, 1834, 2 vols., 12mo; Promenade en Amérique, par J. J. Ampère, Paris, 1856, 2 vols., 8vo; Travels of a Naturalist in Japan and Manchuria, by Arthur Adams, London, 1870, 8vo; The Anglo-Saxon Home, by John Thrupp, London, 1862, 8vo; Memoria sobre Filipinas y Joló, por Patricio de la Escosura, Madrid, 1882, 8vo; Voyage de la Corvette La Bayonnaise dans les Mers de Chine, par Jurien de la Gravière, Paris, 1885, 2 vols., 8vo; El Archipiélago Filipino, por José Montero y Vidal, Madrid, 1886, 8vo; Voyage Round the World, 1803-1806, by A. J. von Krusenstern, 2 vols. in 1, London, 1813, 4to; Nieuw Guinea, Ethnographisch en Natuurkundig, Amsterdam, 1862, 8vo, and Atlas, 4to; Les Philippines, par J. Mallat, Paris, 1846, 2 vols., 8vo; Diccionario Geografico, Estadístico, Histórico, de la Isla de Cuba, por Jacobo de la Pezuela, Madrid, 1863-67, 4 vols., 4to; Journal of an Exploration in the Spring of the Year 1750, by Thomas Walker, Boston, 1888, sq. 8vo; Flowers and Fruits; or, Thirty-six Years in Texas, by Z. N. Morrell, Boston, 1873, 16mo; Narrative of the Late Expedition to the Dead Sea, from a Diary, etc., edited by Edward P. Montague, Philadelphia, 1849, 12mo; The City of New York in the Year of Washington's Inauguration, by Thomas E. V. Smith, New York, 1889, 8vo; Incidents of a Trip through

the Great Platte Valley, New York, 1867, 12mo; The Black Man; or, Haytian Independence, by M. B. Bird, New York, 1869, 12mo; Through Asia, by Sven Hedin, New York, 1899, 2 vols., 8vo; With Kitchener to Khartoum, by G. W. Steevens, New York, 1898, 8vo; La Vie à Madagascar, par Henry Mager, Paris, 1898, 8vo; Geschichte der Isländischen Geographie, Th. Thoroddsen, Band II, Leipzig, 1898, 8vo; Almanach de Gotha, 1899, Gotha, 1899, 8vo; Atlas National Illustré des Départements et des Possessions de la France, par V. Levasseur, Paris, 1849, folio; Journey from Madras through the Countries of Mysore, Canara, and Malabar, etc., by Francis Buchanan, London, 1807, 3 vols., 4to; Travels in Italy, Greece, and the Ionian Islands, by H. W. Williams, Edinburgh, 1820, 2 vols., 8vo; The Human Species, by A. de Quatrefages, London, 1879, 8vo; Nieuwe Geographische Nederlandsche Reise-en Zak-Atlas, etc., Te Amsterdam, 1773, 8vo; Atlas portatif à l'usage des voyageurs dans l'Oberland Bernois, Bern, 1816, 8vo; Voyage Pittoresque dans les Pyrénées Françaises, etc., par J. A. Cervini, de Macerata, à Paris, 1826-1830, folio; Royal Dictionary: English and French, by Fleming and Tibbins, Paris, 1841-1844, 2 vols., 4to; Behramji M. Malabari, a Biographical Sketch, by Dayaram Gidumal, London, 1892, 8vo; The Burman, his Life and Notions, by Shway Yoe, London, 1896, 8vo; The History of Cholera in India, 1862 to 1881, by H. W. Bellew, London, 1885, 8vo; Volcanoes of North America, by Israel C. Russell, New York, 1897, 8vo.

GIFTS.

From Daniel G. Brinton, Author:

The Linguistic Cartography of the Chaco Region, Philadelphia, 1898, 8vo; A Record of Study in Aboriginal American Languages, Media, Pa., 1898; On Two Unclassified Recent Vocabularies from South America (reprint), 1898.

From the Century Company, Publishers:

Cuba and Porto Rico, with the Other Islands of the West Indies, by Robert T. Hill, New York, 1898, 8vo.

From Henry Gannett, Author:

The Aims and Methods of Cartography, with Special Reference to Topographic Maps now under construction in Maryland. By Henry Gannett (Spécial Publication, Vol. II., Part IIIa., Maryland Geological Survey.)

From Walter R. T. Jones:

The Stone Idols of New Mexico: A Description of those belonging to the Historical Society of New Mexico, Santa Fé, N.M., 1896, 8vo.

From Jules Leclercq, Author:

Voyage au Mont Ararat (reprint in Russian), par Jules Leclercq; Les Temples Souterrains de Ceylan, par Jules Leclercq. (Extrait.) Bruxelles, 1898.

From the Lords Commissioners of H. M. Treasury, London:

Report on the Scientific Results of the Voyage of H. M. S. Challenger, 1872-76, London, 1880-95, 50 vols., 4to.

From Fred W. Lucas, Author:

The Annals of the Voyages of the Brothers Nicolo and Antonio Zeno, etc., London, 1898, 4to.

From E. L. Plumb:

Map of the Caroline Islands. Published by the Royal Geographical Society, Dec. 12th, 1898, sheet, 20½ x 12¾.

From G. P. Putnam's Sons, Publishers:

The Rivers of North America, by Israel C. Russell, New York, 1898, 8vo.

From Charles M. Taylor, Jr., Author:

Vacation Days in Hawaii and Japan, Philadelphia, 1898, 8vo.

NOTES AND NEWS.

IN JANUARY, 1899, will be issued in this city the first number of a quarterly journal designed to promote the interests of anthropology in America. The subscription price will be \$4.00.

Each number, consisting of about two hundred octavo pages, will contain original papers, scientific notes and news and a current bibliography of Anthropology.

The new publication will take the place of the *American Anthropologist*, under the same name, or one of two others: *The American Journal of Anthropology*, or *Anthropology*.

The editorial board is composed of Dr. Frank Baker, Dr. Franz Boas, Dr. D. G. Brinton, Dr. George M. Dawson, Dr. George A. Dorsey, Prof. W. H. Holmes, Maj. J. W. Powell, Prof. F. W. Putnam, and F. W. Hodge, *Secretary and Managing Editor*.

The publishers will be Messrs. G. P. Putnam's Sons.

POPULAR LECTURES IN GEOGRAPHY.—The popular lectures for workingmen and women, given by the Board of Education of New York City, and managed by Dr. H. M. Leipziger, are now a very important part of the educational system of the city. The very large audiences, gathered from among all classes, listen with not only courteous, but interested attention. The people are not drawn together for amusement or from curiosity, but from a desire to be informed. The desire to know is very apparent in the majority of the faces that a lecturer meets in any part of the city.

Within the last two years Dr. Leipziger has planned courses at the various lecture centres so that a certain amount of concentration and continuity of thought is possible. This is well illustrated by the arrangements for the first course of lectures for 1898-99, running from October to January. Lectures are given at 38 different places in all parts of the Boroughs of Manhattan and the Bronx. At these centres 657 lectures will be given in the courses mentioned. Of these lectures, 207 will be on geographical subjects, usually in courses of 6, 8, 9, or 10 lectures each. 126 lectures will be given on the descriptive geography of different parts of the world, especially those parts now in the public mind; 55 lectures will be given on North America, and 20 on the United States. A course of six will be given in Anthropology.

The popularity and importance of geographical subjects is, we think, well shown by the proportion of time devoted to such sub-

jects. This is an encouraging thing for working geographers, and deserves a wider recognition. If such work can be sustained in a popular way, it will not be long before the parents of this city will be demanding better geography work in schools, and overturning the generally accepted feeling that *any one* can teach geography.

R. E. D.

THE CITY LIBRARY ASSOCIATION, Springfield, Massachusetts, will open in March, 1899, an exhibition of material relating to geography and geology.

The first purpose of this undertaking is to show the latest and best material for the use of instructors of all grades, from the primary school and kindergarten to the college and university. With this object in view the Association desires to secure copies of the best text-books, periodicals, maps, charts, relief maps, models, globes, lantern slides, collections of specimens, and devices of all kinds for teaching geography and geology.

Another and very important object of the exhibition is, to interest the general public in recent progress in the sciences of geography and geology and to demonstrate that progress, as far as possible, by the display of published results.

Special attention will be paid to a display of such material as will be of value to those who are interested commercially in foreign countries, and especially in the republics of South and Central America and in Mexico.

The exhibition will continue for several weeks.

DR. D. G. BRINTON has reprinted from the *Proceedings of the American Philosophical Society*, Vol. XXXVII, his paper on the Linguistic Cartography of the Chaco region. This paper, which is illustrated by a coloured map, supplements the pages devoted to the Chaco tribes in the author's volume on *The American Race* (New York, 1891). Another reprint is On Two Unclassified Recent Vocabularies from South America.

With these two comes a contribution to bibliography. Under the title of a *Record of Study in Aboriginal American Languages*, Dr. Brinton prints for private distribution a list of his writings on American linguistics to the number of 71, down to the month of October, 1898.

Students in this difficult line will recognize the value of such a list.

COLLECTIVE WISDOM is an excellent thing. The National Educational Association has adopted certain changes in spelling: for programme, *program*; for though, *tho*; for although, *altho*; for thorough, *thoro*; for thoroughfare, *thorofare*; for through, *thru*; for throughout, *thruout*;

for catalogue, *catalog* ; for prologue, *prolog* ; for decalogue, *decalog* ; for demagogue, *demagog* ; for pedagogue, *pedagog*. (*The Educational Review*, Nov., 1898, p. 402.)

These mutilated words are not unlike the forms evolved by the deep mind of dauntless infancy, wrestling with the parts of speech ; but they lack the charm of the child's performance.

THE ALASKA GEOGRAPHICAL SOCIETY has just been organized at Seattle, Washington. Its field of activity is not limited, as might be inferred from its name, to the territory of Alaska, but embraces the world.

The new society desires to enter into relation and to exchange publications with similar associations at home and abroad.

The president is Arthur C. Jackson, F.R.G.S., and the secretary Prof. Frederick I. Mosen.

THE AUGUSTANA COLLEGE AND THEOLOGICAL SEMINARY, Rock Island, Illinois, has brought out the first number of the Augustana Library publications, a paper on the Mechanical Composition of Wind Deposits, by Johan August Udden.

This is a careful study of observations on drifting sand, lee sand and atmospheric dust, illustrated by nearly forty tables.

THE OTTAWA LITERARY AND SCIENTIFIC SOCIETY, which was incorporated at the close of the year 1869, has just issued the first number of its Transactions.

The society is the outgrowth of the Mechanics Institute, founded in 1847, re-named the Bytown Mechanics Institute and Athenæum in 1853, and afterwards consolidated with the Ottawa Natural History Society. Besides the introduction and an historical sketch the papers in this first number are: The Name of Ottawa; The Violinist; Place Names of Canada; The Fur Seal of the North Pacific; The Yukon and its Gold Resources, and the Utilization of Moss Lands.

The article on Place Names presents, with many historical reminiscences, a bit of curious misinformation in the following footnote on page 37:

The evolution of the word "boss" is interesting. It was originally *base*—the man at the base; the man upon whom the enterprise rests. We say, "It rests with him to make it a success." The early Dutch on this continent used the word *Baas*, and the English sounding of "boss" soon came to spell it so.

The Dutch word *baas*, which means *master*, is in no way related to the English word *base*. According to the Introduction the city of Ottawa is without a public library, and this regrettable condition may have something to do with the confusion of ideas in the footnote.

THE ROYAL GEOGRAPHICAL SOCIETY makes the following appeal on behalf of a National Antarctic Expedition:

A joint committee of the Royal Society and of our own society has been formed for the purpose of obtaining funds for the equipment of a National Antarctic Expedition.

The Fellows of the Society are so fully informed as to the many strong reasons for the exploration of the vast unknown Antarctic area, that it is unnecessary to repeat them. All the scientific societies in the Kingdom are unanimous as to the necessity for such an expedition, and the value of the results which would accrue. Her Majesty's Government have been urged to undertake the work, but while they do not see their way to do so directly, they have expressed their strong interest in, and approval of, the movement for obtaining the necessary funds from private sources.

There is no time to lose. In 1900 Germany will send out a fully equipped expedition for Antarctic exploration; and the scientific men who have been active in promoting the enterprise look to Great Britain for coöperation. The field is vast, and there is ample room for more than one adequate expedition.

Unless, then, this country is content to sit still and see herself superseded in a field in which she has hitherto held the foremost place, we must be assured of the necessary funds without delay. For an adequately equipped expedition, prepared to remain at work for two or three years, the sum of £100,000 is required. If the whole amount cannot be obtained, the Committee are resolved to do what they can with whatever funds may be placed at their disposal.

Out of the funds of the Society the Council contribute £5,000; a like sum is promised by Alfred Harmsworth, Esq.; the President, Sir Clements Markham, K.C.B., contributes £100; and smaller sums have been promised.

On behalf of the Council, I appeal to the Fellows for help according to their means; for, after the Government, the responsibility of maintaining the credit of the nation in this respect devolves upon the Royal Geographical Society more than upon any other body.

Contributions may be sent, to the credit of the National Antarctic Expedition, to Messrs. Cocks, Biddulph & Co., Charing Cross, S.W., or to the Society, 1 Savile Row, W.

CLEMENTS R. MARKHAM,
President, Royal Geographical Society.

1 SAVILE ROW, LONDON, W.
November 21, 1898.

THE XIXTH FRENCH GEOGRAPHICAL CONGRESS, which was held at Marseilles, in September last, made the following recommendations, among others:

That a detailed lithological and bathymetrical chart of the French submarine coast be prepared as promptly as possible;

That the number of hours allotted to geography in the scheme of secondary instruction be increased so as to give more importance to colonial geography and the geography of France; and that instruction in geography hold the same place in the classical as in the modern course;

That the Government proceed to put in execution, with the coöperation of private initiative and that of the municipalities and elected bodies, the plan for the organization of colonial instruction in a certain number of universities;

That a free port be created at Marseilles;

That the canal from the Rhone to Marseilles be begun, and that the Etang de Berre (in the Department of the Bouches-du-Rhône) be utilized ;

That the works necessary to restore the navigability of the Loire be undertaken ;

And that the plan for a canal between the Loire and the Garonne be perfected and executed ;

That the geographical societies use their best efforts for the formation of departmental syndicates to arrest the destruction of forests, to restore them wherever desirable, and to protect the natural reservoirs of waters, such as lakes, ponds, etc., and prevent obstruction of the streams.

THE ANNALES DE GÉOGRAPHIE, for November 15, has a paper by M. Henri Lorin on the Congo Railway, which is destined, he thinks, to play a chief part in the economical and political history of Africa.

Large plantations are already in existence above Stanley Pool, and optimists declare that within ten years the Congo will produce all the coffee required by Belgium, and will have become one of the first markets in the world for cacao and tobacco.

Plans are now being made for the regulation of the rubber trade, so as to prevent the destruction of the trees and vines, and also for the protection of the elephant, now in danger of extermination by the ivory hunters.

The cost of transportation on farming implements, salt and rice, has already been reduced fifty per cent., and it is easy to foresee the day when other railroads will be built.

BUDAPEST IN 1896.—The Statistical Bureau of Budapest has published the detailed results of the census of the city taken on the 15th of November, 1896. Including the garrison of 16,220 soldiers, the population amounted to 617,856; an increase, since January, 1891, of 111,472.

Dr. von Körösy, the director of the Bureau, estimates the probable population on the 1st of July, 1900, at 685,340.

THE SINOPSIS ESTADÍSTICA Y JEGRÁFICA DE LA REPÚBLICA DE CHILE, for 1897, estimates the area of the country at 753,216 square kilometres (290,828 square miles), and the population on the 31st of December, 1897, at 3,049,352*.

The foreign commerce of the Republic in 1897 amounted to a total value of 130,256,938 dollars, 18,185,281 dollars less than the total for 1896. The decrease is attributed to three causes: an

* According to the U. S. Census of 1890, the State of Texas has an area of 265,780 square miles and a population of 2,235,500.

industrial crisis, a lower ruling price for mineral products, and a scarcity of capital.

The most important article of export is nitrate of soda, of which Chile has furnished in the 68 years, 1830-1897, the amount of 388,298,125 quintals (Spanish)=39,218,110,625 pounds.

The greatest exportation for one year was, in 1893, 27,285,205 quintals; that for 1897 was 23,970,789.

THE DEATH, on the 19th of November, of Commandant Bonetti, one of the oldest vice-presidents and most active members of the *Société de Géographie Commerciale*, of Bordeaux, is announced in the *Bulletin*, No. 21-22.

LECTURES.—At the Annual Meeting, January 16, 1899, Mr. Edward C. Barnard, of the U. S. Geological Survey, will describe the Yukon Valley and the work of exploration by the party under his command in the Forty-Mile District, in the Klondike region.

On the 13th of February, Mr. H. M. Wilson, Topographer, U. S. Geological Survey, will address the Society on the Island of Porto Rico, its Topography and Aspects.

OBITUARY.

DON FRANCISCO COELLO DE PORTUGAL Y QUESADA.

It is with deep regret that we receive from the Geographical Society of Madrid the intelligence of the death, on the 30th of September last, of the eminent geographer, who was the founder of the Society and for so many years its honoured president.

Col. Coello belonged to the Corps of Military Engineers. He was an associate of the Royal Academy of History and a member of the Council for the Colonies.

An accomplished scholar and unwearied student, he was devoted to historical and scientific geography, to which he made many valuable contributions, only less known than his monumental Atlas of Spain.

The *Revue de Géographie*, for November, says of him:

He was born at Jaen in 1822, and was graduated with the highest honours as a military engineer in 1839. In 1844 he was detached on special service in Algeria, with the rank of Captain of Engineers, and he spent a year with the French expeditionary columns. In 1858, having been appointed on the Statistical Commission, he was charged with the direction of the district Cadastral Survey. He attained the grade of Colonel in 1865 and became the director of the Government geographical, geodetic and geological surveys; but he resigned his post the next year on account of difficulties which had arisen with the Prime Minister, Narvaez, and retired from the army.

His work as a geographer is of the first order.

Col. Coello was elected a corresponding member of the American Geographical Society in the year 1894.

TRANSACTIONS OF THE SOCIETY.

A Regular Meeting of the Society was held at Chickering Hall on Monday, November 14, 1898, at 8.30 o'clock, P.M.

President Daly in the chair.

The following persons, recommended by the Council, were elected Fellows:

Miss Mary Perkins Quincy, New Haven.
Percy R. Pyne (Life).
Samuel E. Stokes Allen, Holmesburg, Pa.
Joseph A. Marsh.
Charles Paul MacKie.

The President introduced Mr. George Byron Gordon, of the Peabody Museum, Cambridge, Mass., who gave an account of the work performed by the museum in the exploration of Copan, the ruined city of Honduras.

On motion, the Society adjourned.

A Regular Meeting of the Society was held at Chickering Hall on Monday, December 12, 1898, at 8.30 o'clock, P.M.

President Daly in the chair.

The following persons, approved by the Council, were elected Fellows:

W. F. Allen.	Frederick A. Pell (Life).
Walter Abbott, Boston, Mass.	Edward Stephen Rawson.
Herbert Appleton.	F. Brevoort Allin (Life).
Harry Alexander.	Berkeley Balch.
Charles P. Armstrong.	James Harold Warner.
Thomas H. Bauchle.	Miss Serena Rhineland (Life).
George Coppel.	William Shillaber, Jr.
M. Dwight Collier.	Edgar C. Moxham.
Thomas J. Hurley.	Charles W. Zaring.
Wolcott G. Lane.	Donald McLean.
James H. Bailey.	Felix M. Warburg.
Luther G. Gadd.	John Ph. Voelker.
George Holmes.	W. A. Underwood.
O. H. Kahn.	Louis P. Bayard, Short Hills, N. J.
Newbold Morris (Life).	William R. Warner, Philadelphia, Pa.
A. E. Piorkowski, Captain, I. G. Army.	Charles H. Moss, Sandusky, O.

Joseph D. Redding.

Rev. A. F. Schauffler.

John E. Roeser.

George F. Seward.

George F. Brownell.

John V. L. Pruyn.

Almeric H. Paget (Life).

P. B. Weare, Chicago, Ill.

Charles M. Taylor, Jr., Philadelphia, Pa.

Edward A. Woods, Pittsburg, Pa.

James Steuart MacKie.

William Pennington, Paterson, N. J.

The President then introduced Mr. Cosmos Mindeleff, who addressed the Society on the subject of Aboriginal Architecture in the United States.

On motion, the Society adjourned.

INDEX TO VOL. XXX.

	PAGE		PAGE
Abercrombie, Captain, in Alaska...	412	Antarctic Exploration.....	329
Aboriginal Architecture in the		— Exploration, German, Plans for	165
United States. By Cosmos Min-		Anthropological Expedition to	
deleff.....	414	Torres Strait.....	167
Accessions to the Library,		"Appearances of Land," Le, nella	
87, 174, 272, 352, 462		Zona Antartica, per Arnaldo Faus-	
Aconcagua, Highest mountain of		tini, <i>noticed</i>	85
America.....	428	Arabia, Exploring in Southern....	431
Across the Everglades. By Hugh		Arctic Club of America.....	178
L. Willoughby, <i>noticed</i>	172	Argentina, Survey of the Andine	
Admiralty Surveys in 1897.....	323	region, <i>noticed</i>	346
Africa, Cavendish in.....	162	Argentine Geography and the An-	
Agassiz on the Coral Reefs of the		cient Pampean Sea, <i>noticed</i>	355
Fiji Group.....	62	Arid regions—Spain and California	
Alaska, Central, Exploration of....	408	compared.....	340
— Central. Map of, <i>noticed</i>	169	Arkansas River.....	6, 7
— Chittenaar River.....	129	Artesian basins in the West.....	8
— Geographical Society organized	466	Atlantic, Meteorological Stations in	
— Gold Fields of.....	160	the.....	166
— Map of the Gold Fields of,		Atlas, Century, <i>noticed</i>	266
issued by the U. S. Geological		— di Giuseppe Pennesi, <i>noticed</i> ..	451
Survey, <i>noticed</i>	168	— United States Geologic, Pueblo	
— Mentasta Pass.....	128	Folio <i>noticed</i>	79
— Miles Glacier.....	130	— United States. Sheets <i>noticed</i>	
— Scolai Pass.....	128	78, 168, 264, 342, 448	
— Surveys.....	147, 255, 331	— United States, Statistical.....	333
— U. S. General Land Office map		— United States. Topographic.	
of, <i>noticed</i>	343	Folio, 1, <i>noticed</i>	266
Allegheny, The Upper.....	379	Augustana College and Theological	
America, Diplomatic History of, etc.		Seminary, First publication.....	466
By Henry Harrisse, <i>noticed</i>	170	Au Pays des Ba-Rotsi Haut-Zam-	
— South. Harvard Meteoro-		bèse, etc. Par Alfred Bertrand,	
logical Stations in.....	66	<i>noticed</i>	349
— South. An Indian Telegraph.	317	Bad Lands, S. Dakota.....	335
American Association for the Ad-		Barents Sea, Refuge for Sealers....	259
vancement of Science, Fiftieth		Barnard, E. C., in Alaska.....	411
Anniversary.....	305	Baschin, Otto. Die Verwendbarkeit	
American Geographical Society, An-		von Luftballons, etc., <i>noticed</i>	84
nual Meeting.....	93	Basins in Plains of the West.....	442
— By-laws.....	vi.	Belgian Antarctic Expedition.....	164
— Charter, Amended.....	iii	Beni Hassan, Tombs of.....	22
— Charter of Incorporation.....	i	Bertrand, Alfred. Au Pays des Ba-	
— Honorary and Corresponding		Rotsi Haut Zambèse, <i>noticed</i>	349
Members and Fellows.....	359	Bielz, Dr. Edward Albert, Death of.	276
— Laws of New York, Chap. 650.	iv.	Bonetti, Commandant, Death of....	469
— Transactions of.....	93, 180, 471	Book Notices.....	81, 170, 268, 344, 452
American Museum of Natural His-		Boris Godunoff, decrees serfdom...	136
tory, Expeditions of the.....	159	Boundary between Idaho and Mon-	
Andrée, Stadling in search of.....	165	tana.....	73
Annals of the Voyages of the Broth-		Brinton, D. G. Reprints, <i>noticed</i> ..	465
ers Nicolo and Antonio Zeno. By		British West-Indies and Guiana,	
Fred. W. Lucas, <i>noticed</i>	459	Causes of Distress in.....	158
Antarctic Continent, Question of...	165	Budapest in 1896, Census of.....	468
— Expedition, Belgian.....	164	Cairo to Beni-Hassan. By D. Cady	
— Expedition, R. G. Society's		Eaton.....	15
Appeal for.....	467	Cambaryssi, a S. American telegraph	317

	PAGE		PAGE
Camp Verde, Ruin near.....	119	Cora, Guido, leaves Turin.....	67
Canada, Forestry in.....	67	Coral boring at Funafuti.....	62
Canals, Interceanic.....	332	— reefs of the Fiji Group.....	62
— St. Mary's Falls and Suez.....	251	Corresponding Members, <i>A. G. S.</i>	359
Cañon de Chelly.....	115	Cuba and Porto Rico. By Robert	
— Cists of the Navajos.....	121	T. Hill, <i>noticed</i>	454
— Cliff-Dwellers in, religious.....	116	— Reports of Consular officers.....	147
— Ruins in.....	118	— War Department map of,	
Cañon del Muerto, Circular kiva		<i>noticed</i>	169
in.....	117	Davidson, George, takes Chair of	
— Length of.....	115	Geography, College of Commerce	357
— Mummy Cave, ruin in.....	119	Dawson, Samuel Edward. North	
Carnegie, D. Journey through Vic-		America, Vol. 1, Stanford's Com-	
toria Desert.....	59	pendium of Geography and Travel,	
Carranza, Dr. Luis, Death of.....	358	<i>noticed</i>	85
Casa Grande. Interior walls.....	420	Deep Sea Expedition, German.....	324
Causse Region in France, <i>noticed</i>	309	Deep waterways.....	249
Cavate lodges found only in four		Delta of the Po, Growth of.....	260
localities.....	122	Diplomatic History of America, etc.	
Cavendish, H. S. H., in Africa.....	162	By Henry Harrisse, <i>noticed</i>	170
Cave Regions of the Ozarks and		Douglass, A. E. and W. A. Cogs-	
Black Hills, by Luella A. Owen,		hall. Orizaba and Popocatepetl,	
<i>noticed</i>	461	<i>noticed</i>	348
Caverns of Mokana.....	58	Drainage, Effect of Glaciers upon.....	225
Cayuta Lake, Drainage.....	389	— Preglacial.....	375
Celestite Crystals, Paper on, <i>noticed</i>	312	— southwest of Lake Cayuta.....	389
Chemung Valley.....	386	Drift-filled valleys along the lake	
Chile, Population and Commerce in		shore.....	382
1897.....	468	Drumlins.....	217
Chittinah River, Alaska.....	129	Dunkerque, Société de Géographie	
Chittenden, Capt. H. M. Report		de, Bulletin of, <i>noticed</i>	358
on Mississippi Floods.....	153	Eaton, D. Cady. From Cairo to	
Church, George Earl, on the Argen-		Beni Hassan.....	15
tine Geography and the Ancient		Egypt. Beni Hassan, Tombs of.....	22
Pampean Sea, <i>noticed</i>	555	— Thebes, Monumental slab dis-	
Cists of the Navajos, Cañon de		covered at.....	26
Chelly.....	121	Egyptian ideas of Death, the "Ab,"	
Civilisation Hindoue à Java, Les		or heart.....	17
Restes de la. Par Jules Leclercq,		— the "Ba," or spirit.....	17
<i>noticed</i>	81	— the "Ka," or "double".....	16
Cliff Dwellings not found in the Rio		— the "Khaib," or shadow.....	17
Grande Valley.....	121	— the "Osiris," or ghost.....	18
— Origin of the. By Cosmos		— the "Sabu," or outline.....	17
Mindeleff.....	111	— the "Sirdab," dwelling of	
Climate and Commerce.....	259	the "Ka".....	19
— Effect of Mountains upon.....	64	Egyptians, Modern.....	21
Climatic control of occupation.....	65	Eldridge, Geo. H., in Alaska.....	410
Coal production, 1894-96.....	435	Eskers or serpent kames.....	208
Coello y Quesada, D. Francisco.		Espozizione Generale Italiana, to be	
Obituary notice.....	470	held in Turin.....	178
Coffee in the United States.....	436	Estufas, underground chamber.....	117
Cogshall, W. A. and A. E. Doug-		Europe, Population of.....	435
lass on Orizaba and Popocatepetl,		Exploration of Central Alaska.....	408
<i>noticed</i>	348	Extension du Système Décimal aux	
College of Commerce established.....	357	mesures du Temps, etc. Par J.	
Commercial schools.....	438	de Rey Pailhade, <i>noticed</i>	81
Congo Railroad, Completion of.....	164	Fairchild, H. L., on Glacial Geol-	
Congo State, Telegraph across.....	322	ogy in the U. S.....	306, 312
Conway, Sir M. Ascent of Illimani.	317	Faustini, Arnaldo. Le "Appear-	
Copper River as a Route to the		ances of Land" nella Zona Antar-	
Yukon Basin. By C. Willard		tica, <i>noticed</i>	85
Hayes.....	127	Fellows, <i>Am. Geog. Soc.</i>	360

PAGE	PAGE
Fernow, B. E., on the College of Forestry at Cornell University... 313	Harvard Geographical Models..... 67
Fiji Islands, Coral reefs of the 62	— Meteorological Stations in South America..... 66
Floods of the Mississippi River... 67, 153	Havana Province, U. S. War Department Map of, <i>noticed</i> 169
Forest district, New Russian..... 431	Hawaii, Pearl Lochs..... 277
— Reservations in the United States..... 74, 149	Hayes, C. Willard. Copper River as a Route to the Yukon Basin... 127
Forestry Association, Annual Meeting of... 444	Hedin, Sven, Medal awarded to... 260
— College of, at Cornell University. B. E. Fernow on... 313	Herbertson, A. J. Report on Geography in Education, <i>noticed</i> 271
— in Canada..... 67	Hill, Robert T. Cuba and Porto Rico, <i>noticed</i> 454
— in the Department of Agriculture..... 256	Hinman, Russell, and J. W. Redway. Natural Advanced Geography, <i>noticed</i> 344
French Geographical Congress. Recommendations by..... 467	Hong Kong, Extension of territory. 320
Frobisher Bay Revisited. By Russell W. Porter... 97	Honorary and Corresponding Members and Fellows, A. G. S..... 359
Funafuti, Coral boring at..... 62	Hovey, Horace C., on The Region of the Causes in France..... 309
Gannett, Henry. Map Notices, 78, 168, 264, 342, 448	Howard, Benjamin. Some Observations on Prisons in Vladivostock and Sakhalin..... 135
— Statistical atlas of the U. S... 333	Hudson River..... 401
Gebelin, Jacques, Death of..... 358	Ice Sheet, Advance of..... 185
Genesee River..... 383	— Retreat of..... 192
Geographical and Statistical Notes on Mexico. By Matias Romero, <i>noticed</i> 171	Idaho and Montana Boundary..... 73
— conditions, Influence of..... 238	Illimani, Ascent of..... 317
— Congress, Seventh International..... 445	Illustration. Boas Glacier..... 108
— Congress, XIXth French..... 467	— Boas Glacier, Face of..... 109
— Models, The Harvard..... 67	— Boulder Clay in Pennsylvania. 41
— Notes, from the T'oung-Pao. By G. Schlegel, <i>noticed</i> 348	— Boulder-strewn surface, Cape Ann, Mass..... 213
— Society organized at Seattle... 466	— Bouldery Moraine, Cape Ann (Mass.)..... 199
Geographic Conditions that make great Commercial Centres. By Alfred F. Sears, C.E..... 281	— Bouldery Morainic Till, Cape Ann, Mass..... 212
— Names, The U. S. Board on... 156	— Conditions of Plain and Plateau 28
Geographische Gesellschaft, Hamburg, Twenty-fifth Anniversary.. 178	— Conglomerate Boulder..... 53
Geography, Board of Education Lectures, <i>noticed</i> 464	— Cornell Glacier, Greenland... 190
— in Educational System, Great Britain, <i>noticed</i> 271	— Cornell Glacier, Terminal moraine..... 191
— of the Laurentian Basin. By Israel C. Russell..... 226	— Cross-Section, Six Mile Creek. 397
— Physical, First book of. By Ralph S. Tarr, <i>noticed</i> 83	— Delta in a lake..... 45
German Deep Sea Expedition..... 324	— Delta plain, Malaspina Glacier 43
Giles, Ernest, The Death of..... 60	— Development of Plain..... 29
Glacial erosion..... 223	— Drumlins, Five illustrations of, 219, 220, 221, 222
— Geology in America, <i>noticed</i> , 306, 312	— Enfield Gorge, Step Fall..... 395
— Period. Its influence upon topography..... 183	— Esker, Auburndale, Mass. 209, 210
Glaciers, Caucasian, Retreating... 430	— Everett Mountains..... 107
Glenn, Captain, in Alaska..... 412	— Genesee Falls, Lower..... 385
Gold Fields of Alaska..... 160	— Glacially scratched pebble... 188
"Gulfs" of Western New York... 381	— Glacial scratches on bed rock. 189
Hallstätter Lake, Investigation of.. 261	— Glaciated surface, Nugsuak Peninsula, Greenland..... 224
Harrisse, Henry, Diplomatic History of America, <i>noticed</i> 170	— Greenland Ice Plateau..... 188
	— Greentree Falls..... 391
	— High Plain or Plateau..... 50
	— Hudson Valley and New York Bay..... 403
	— Ithaca Falls..... 394

	PAGE		PAGE
Illustration. Lake Cayuga valley..	398	Lake Chad, Steamboat on.....	322
— Lakes in Moraine, Colorado..	197	— deposits.....	206
— Montezuma Marshes.....	46	Lake Region, Agricultural resources.	245
— Moraine, Cayuga Valley.....	196	— Commerce.....	247
— Moraine, Cayuga Valley, Sec-		— Deep waterways.....	249
tion of.....	200	— during Glacial Times.....	229
— Moraine in Pennsylvania....	191	— Forests.....	246
— New Jersey Pinelands.....	36	— in Pre-Glacial Time.....	227
— Niagara Gorge, End of.....	54	— in Post-Glacial Time.....	230
— Nunatak on Greenland ice pla-		— Mineral resources.....	244
teau.....	189	Lake Rikwa disappearing.....	58
— Peneplain of New England....	55	Landor, A. H. Savage. In the For-	
— Plain in Western Kansas.....	52	bidden Land, <i>noticed</i>	457
— Plains in Western Kansas,		Lapparent, A. de. Leçons de Géo-	
Buttes on.....	51	graphie Physique. <i>noticed</i>	453
— Salt Marsh plain at Ipswich,		Laurentian Basin, Fisheries.....	247
Mass.....	35	— Geography of the. By Israel	
— Section of buried valley.....	216	C. Russell.....	226
— Section of delta.....	33	Laurentian Lakes, <i>table</i>	226
— Section of drift-filling.....	216	— Water discharged.....	227
— Sillmans Fossil Mount, three		Leclercq, Jules. Les Restes de la Civ-	
views.....	102, 103, 104	ilisation Hindoue à Java, <i>noticed</i> ..	81
— Stratified drift, Ithaca, N. Y..	194	Leçons de Géographie Physique, par	
— Stream in the Adirondacks....	39	A. de Lapparent, <i>noticed</i>	453
— Taughannock Falls.....	392	Littlehales, G. W. Recent Advances	
— Taughannock, Preglacial valley	393	in Geographic Knowledge by the	
— Terrace formation.....	48	U. S. Hydrographic Office.....	124
— Triphammer Falls.....	396	— The U. S. Mid-Pacific Naval	
Indian Territory. First sheet of		Supply Station.....	277
survey, <i>noticed</i>	342	Loewe, Richard. Die Reste der	
International Geographical Congress,		Germanen am Schwarzen Meere,	
Seventh.....	445	<i>noticed</i>	456
Interoceanic canals.....	332	Lucas, Fred. W. Annals of the	
In the Forbidden Land. By A. H.		Voyages of the Brothers Nicolò	
Savage Landor, <i>noticed</i>	457	and Antonio Zeno, <i>noticed</i>	459
Irrigation, Arkansas river basin...	6	Lütke, founder of Russian Geo-	
— Artificial lakes for storing		graphical Society.....	260
water.....	9	Madagascar, Homère et la Civilisa-	
— Average water-rental.....	5	tion Mycénienne, par F. du Mes-	
— Character of Irrigable lands...	7	gnil, <i>noticed</i>	456
— Farms under, in the United		Mahan, Capt. Alfred T., U. S. N.,	
States.....	4	(retired), delegate to the Toscan-	
— Relations of, to Geography, by		elli-Vespucci Celebration.....	180
Herbert M. Wilson.....	1	Map. Alaska, Central, <i>noticed</i>	169
Italy, Geological Map of, <i>noticed</i> ...	169	— Alaska, Gold fields of, <i>noticed</i> ...	168
Japan. Population of.....	436	— Alaska, U. S. General Land	
Kaaters Kill and Plaaters Kill....	406	Office map of, <i>noticed</i>	343
Kames in New York.....	207	— American Ice Sheets.....	186
Kansas, Sink hole near Meade....	443	— Bay south of Brooklyn.....	34
Kiao-Chau and Shantung.....	57	— California and Nevada, <i>noticed</i> ...	79
— Bay.....	160	— Catskills and Hudson Valley....	402
Kilima-Njaro, Dr. H. Meyer's expe-		— Copper River Basin. <i>Facing</i> ...	127
dition to.....	261	— Copper River. Sketch of a por-	
Kivas not found in summer settle-		tion of.....	131
ments.....	117	— Cuba, War Department map of,	
— Preservation of.....	122	<i>noticed</i>	169
— Underground chambers.....	117	— Deep waterway routes in the	
Keltie, J. Scott. The Statesman's		U. S. <i>Facing</i>	253
Year-Book, <i>noticed</i>	171	— Delta, head of Galveston Bay. 32	
Korsakoff, Sakhalin.....	141	— Drainage of Upper Ohio.	381
Lake Bangweolo, Circumnavigation		— Drumlin region north of Cay-	
of.....	321	uga Lake.....	218

	PAGE		PAGE
Map. England and Wales, Geological map of, <i>noticed</i>	79	Mexico, Geographical and Statistical Notes on. By Matias Romero, <i>noticed</i>	171
— Frobisher Bay, Chart of. <i>Facing</i>	97	Meyer, Dr. H. Expedition to Kilima-Njaro.....	261
— Genesee valley.....	384	Miles Glacier, Alaska.....	130
— Havana Province, U. S. War Department, <i>noticed</i>	169	Millosevich, Elia. Discussione delle Osservazioni Astronomiche, ecc., <i>noticed</i>	347
— Hudson River Valley submerged.....	405	Mindeleff, Cosmos. Aboriginal Architecture in the United States.....	414
— Ice-Sheet in Eastern U. S.....	187	— Origin of the Cliff Dwellings.....	111
— Japan, Geological Survey agromomic map of, <i>noticed</i>	79	Mississippi River, Areas for water-storage.....	155
— Java, Bantam Residency, Map of, <i>noticed</i>	79	— Floods.....	67, 153
— Kansas, Geological Survey Map of, <i>noticed</i>	450	— Floods due mainly to the Ohio.....	154
— Kiao-Chau Bay.....	161	— Fluctuations of the.....	441
— Lake Algonquin, Trent River, etc.....	234	Mohawk River.....	399
— Lakes Chicago and Warren.....	233	Moki kivas or estufas.....	117
— Lakes Maumee, Chicago and Duluth.....	231	— snake-dance.....	117
— Lakes Whittlesey, Saginaw and Chicago.....	232	Montana and Idaho Boundary.....	73
— Mexico, Government Survey, <i>noticed</i>	79	Montezuma Castle, Cliff ruin.....	119
— Migration of Seals, <i>noticed</i>	449	Moraine in New York, Extent of.....	202
— Mombasa, <i>noticed</i>	451	— Internal structure.....	199
— Moraine in New Jersey.....	198	— Irregularities of.....	200
— Netherlands, Map of, <i>noticed</i>	79	Moraines. <i>Topography</i>	196
— New York State, Extent of Ice in.....	192	Moreno, F. P. Survey of the Andine region, Argentina, <i>noticed</i>	346
— New York State, Moraines in Western.....	193	Morgan, M. de. Investigations of soil by boring, in Egypt.....	20
— New York State, Relief map of.....	376	Mountains, their effects on climate.....	64
— Nipissing Lakes, etc.....	236	Murray, Sir J., on Ocean Temperatures.....	325
— Notices. By Henry Gannett. 78, 168, 264, 342.....	448	Nathorst, A. G., Cruise around Spitzbergen.....	326
— Oahu.....	278	Natural Advanced Geography. By Jacques W. Redway and Russell Hinman, <i>noticed</i>	344
— "Our New Colonies"—Cuba, etc., <i>noticed</i>	266	Navajo. Dedication of hogans.....	426
— Pearl Lochs. <i>Facing</i>	277	— houses (hogans).....	423
— Plateau of W. Central New York. <i>Facing</i>	50	— weaving.....	426
— Preglacial drainage.....	380, 381	Nebraska, Western.....	334
— Preglacial stream-courses.....	389	New York State, Caverns in.....	407
— Preglacial valley.....	387	— Deltas.....	44
— Sweden, General staff map, <i>noticed</i>	79	— Extent of moraine in.....	202
— United States, Land Office Map of, <i>noticed</i>	449	— Gorges in Finger Lakes region.....	390
— United States Life zones, <i>noticed</i>	450	— "Gulfs" of Western.....	381
Mastaba.....	18	— Hudson River.....	401
Mentasta Pass, Alaska.....	128	— Interglacial gorges.....	395
Mesa building-stone.....	113	— Lake deposits.....	206
— country.....	113	— Map, Progress on the.....	73
Mesgnil, F. du. Madagascar, Homère et la Civilisation Mycénienne, <i>noticed</i>	456	— Mohawk River.....	399
Meteorological Stations in the Atlantic.....	166	— Rivers of.....	375
Mexico, Free Zone.....	318	— The Physical Geography of. By Ralph S. Tarr.....	28, 183, 375
		Niagara Falls, The Age of, etc., G. Frederick Wright on.....	310
		Niagara River, History of, <i>noticed</i>	310
		North America, Vol. I., Canada and Newfoundland. By Samuel Edward Dawson (Stanford's Compendium), <i>noticed</i>	85

	PAGE		PAGE
Northward Over the "Great Ice."		Plains, Salt-marsh.....	33
By Robert E. Peary, <i>noticed</i>	268	— Sand.....	45
Notes and News. 92, 178, 275, 355, 464		— Terrace.....	44
Obituary.—Coello y Quesada, D.		— Volcanic.....	47
Francisco.....	470	— Wave-cut.....	47
Observations on Prisons in Vladivostock and Sakhalin. By Benjamin Howard.....	135	Po Delta, Growth of.....	260
Occupation, Climatic control of.....	65	Population of Europe.....	435
Ocean Temperatures, Sir J. Murray	325	— of Japan.....	436
Oran, Société de Géographie et d'Archéologie d', 20th Anniversary	179	Porter, Russell W. Frobisher Bay Revisited.....	97
Origin of the Cliff Dwellings. By Cosmos Mindeleff.....	111	Potomac River, Pollution of the ...	70
Orizaba and Popocatepetl. By W. A. Cogshall and A. E. Douglass, <i>noticed</i>	348	Preglacial drainage.....	375
Osservazioni Astronomiche, Discussione delle, per Elia Millosevich, <i>noticed</i>	347	Prisons in Vladivostock and Sakhalin, Observations on. By Benjamin Howard.....	135
Ottawa Literary and Scientific Society, Transactions, first number.	466	Pueblo architecture. Kivas, the preservation of ..	122
Owen, Luella A. Cave Regions of the Ozarks and Black Hills, <i>noticed</i>	467	— Architecture, Unit of.....	114
Pearl Lochs, Oahu.....	277	— country, Area of.....	113
Peary, Robert E., Letters from.....	355	— ground-plans, irregular.....	120
— Medal awarded to.....	260	— house, Building of.....	120, 421
— Northward Over the "Great Ice," <i>noticed</i>	268	— Indians an agricultural people.	114
Penepains ..	55	— Indians. Descent in the female line	120
Pennesi, Giuseppe. Atlantic Scolastico, <i>noticed</i>	451	— Indians not pastoral.....	425
Persia, Caravan Routes in.....	432	— masonry.....	419
Peters, J. W., in Alaska.....	411	— migration	418
Petrie, Flinders, Monumental slab discovered at Thebes by.....	26	— subordinate settlements.....	114
Physical Geography of New York State. By R. S. Tarr.....	28, 183, 375	Railway to the North Pole, Plan for	181
Physiography for Beginners and Physiography for Advanced Students. By A. T. Simmons, <i>noticed</i>	270	Recent Advances in Geographic Knowledge by the U. S. Hydrographic Office. By G. W. Littlehales	124
Pinchot, Gifford, on Forest Reserves	150	Record of Geographical Progress, 57, 158, 258, 317, 428	
Plains and Plateaux	28	Redway, Jacques W., and R. Hinman. Natural Advanced Geography, <i>noticed</i>	344
— Classification of.....	30	Relations of Irrigation to Geography, by Herbert M. Wilson.....	I
— Delta.....	32	Reste der Germanen am Schwarzen Meere, Die. Von Dr. Richard Loewe, <i>noticed</i>	456
— Filled bays.....	33	Rey-Pailhade, J. de. L'Extension du Système Décimal, <i>noticed</i>	81
— Filled lake.....	39	Rikwa Lake, disappearing.....	58
— Fluvialite	39	Rio Grande, Navigability of the....	440
— Glacial.....	40	Rio Grande valley, Cliff Dwellings not found in.....	121
— Glacio-fluvialite.....	42	River Pollution.....	70
— Gravel-filled valley.....	42	Rivers of New York.....	375
— Ice-scoured.....	49	— of North America. By J. C. Russell, <i>noticed</i>	452
— Lacustrine.....	37	Rockall Islet.....	68
— Lake delta.....	38	Romero, Matias. Geographical and Statistical Notes on Mexico, <i>noticed</i>	171
— Lake swamp.....	38	Roumania, Geographical Dictionary of, First Fasciculus.....	179
— Marine.....	31	Russell, Israel C. Geography of the Laurentian Basin.....	226
— of denudation.....	49	— Rivers of North America, <i>noticed</i>	452
— of the West, Basins of the....	442		
— Overwash.....	43, 205		
— Raised sea-bottoms.....	36		
— River-cut.....	48		

PAGE	PAGE
Russell, Israel C. Volcanoes of North America, <i>noticed</i>	82
Russian Geographical Society, Founder of.....	260
Sahara crossing in a Balloon.....	433
St. Lawrence, Gulf of, Tide Tables in the.....	166
Sakhalin, Church.....	144
— Knout in.....	144
— Prisoners serve two years....	143
Sannikoff Land, Proposed Expedition to.....	329
Saville, M. H., on Zapotecan Burial Customs.....	312
Schlegel, G., Geographical Notes, <i>noticed</i>	348
Scolai Pass, Alaska.....	128
Seals in a Labrador lake.....	429
Sears, Alfred F. Geographic Conditions that make great Commercial Centres.....	281
Seventh International Geographical Congress.....	445
Siberia, No serfs in.....	136
Simmons, A. T. Physiography for Beginners and Physiography for Advanced Students, <i>noticed</i>	270
Sink hole near Meade, Kansas....	443
Snake-dance, Moki.....	117
Southern Ute Reservation.....	336
Spencer, J. W., on the history of the Niagara River.....	310
Spitzbergen circumnavigated.....	326
— Glaciers of.....	328
Springfield, Mass. Geographical Exhibition.....	465
Spurr, J. E., in Alaska.....	410
Statesman's Year-Book. Edited by J. Scott Keltie, <i>noticed</i>	171
Survey of the National Forest Reserves.....	74
Surveys, Oceanic, in 1897.....	323
Tarr, Ralph S. First Book of Physical Geography, <i>noticed</i>	83
— The Physical Geography of New York State.....	28, 183, 375
Telegraph across the Congo State..	322
— curious South American.....	317
Terrestrial Crust, Relief of the....	63
Thebes, Monumental slab discovered at.....	26
Tide Tables in the Gulf of St. Lawrence.....	166
Till Sheet.....	212
Tin plate industry.....	437
Toll, Baron E. von, plans expedition to Sannikoff Land.....	329
Tonkin, Red River, Sources and Floods of the.....	57
Topography, Influence of the Glacial period upon.....	183
Torres Strait, Anthropological Expedition to.....	167
Toscanelli-Vespucci Celebration at Florence, Delegate to.....	180
Transactions of the Society.....	93, 180, 471
Tripoli, Caravan trade of.....	436
United States, Aboriginal Architecture in the. By Cosmos Mindeleff.....	414
— Atlas sheets, <i>noticed</i>	78, 168, 264, 342, 448
— Board on Geographic Names..	156
— Coast Survey Chart of Yukon mouth.....	413
— Coffee in the.....	436
— Forest Reservations in the....	149
— Geological Survey Map of the Gold Fields of Alaska, <i>noticed</i> ...	168
— Irrigated farms in the.....	4
— Mid-Pacific Naval Supply Station. By G. W. Littlehales.....	277
— Southwest, Explorations in the	332
— Statistical Atlas of.....	333
— Topographic Atlas, Folio 1, <i>noticed</i>	266
Université Nouvelle de Bruxelles...	276, 356
University of California, College of Commerce.....	357
Vasco da Gama Centenary.....	275
Vasconcellos, Ernesto de. Map of Mombasa, <i>noticed</i>	451
Verein für Siebenbürgische Landeskunde, Hermannstadt, 50th Anniversary.....	178
Verwendbarkeit von Luftballons, etc., von Otto Baschin, <i>noticed</i> ...	84
Victoria Desert, Carnegie's Journey through.....	59
Vladivostock, Prison at.....	139
Volcanoes of North America. By Israel C. Russell, <i>noticed</i>	82
Wagner, H., on the Terrestrial Crust.....	63
War Department Map of Cuba, <i>noticed</i>	169
— map of Havana Province, <i>noticed</i>	169
War maps issued in the U. S.....	258
Ward, R. De C., on Wind and Calm belts.....	323
Washington Academy of Sciences..	69
Washington Letter,.....	69, 147, 255, 331, 439
Waterways.....	439
Wellman Expedition.....	328
West Indian Weather Service established.....	319
Willoughby, Hugh L., Across the Everglades, <i>noticed</i>	172
Wilson, Herbert M., Relations of Irrigation to Geography.....	I

	PAGE		PAGE
Wind and Calm belts, R. De C.		Würtemberg, Geological map, <i>noticed</i>	79
Ward on.....	323	Yangtze Kiang, New Rapid in the..	57
"Windward," Departure of the....	262	Yukon Basin, Copper River as a	
Wright, G. F., on Celestite Crystals.....	312	Route to the. By C. Willard	
— on the Age of Niagara Falls,		Hayes.....	127
etc.....	310	Yukon, Coast Survey Chart of mouth	413

